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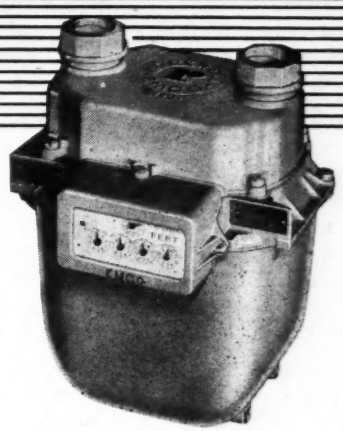

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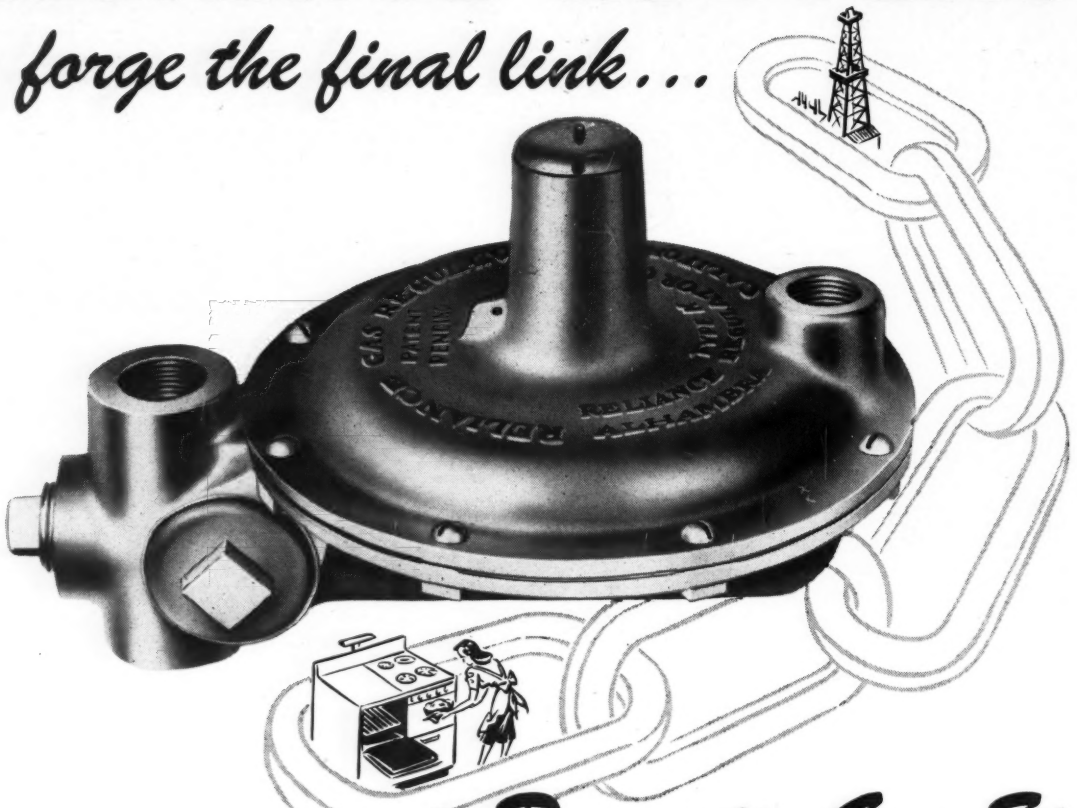

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**ELLIOTT TAYLOR,** Editorial Director
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***Publication Office***

**LOS ANGELES 14,** California, 1709 West Eighth Street, DRexel 4337.

***Branch Offices***

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**L. V. HOHL,** Manager, **NEW YORK 17,** 50 E. 42nd Street, MUrray Hill 2-4504

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# THERMALLY THINKING

By ELLIOTT TAYLOR, Editorial Director

## *Probe's Implications*

THE only sure-fire way to establish a reputation as a prophet is to get your predictions in good and early so the customers will have plenty of time to forget what you promised them if you turn out to have guessed wrong. Then, in a later refresher piece you point out the times you were right—if there were any—and if the law of averages is still in operation, your reputation is made.

As the FPC hearings in Washington reach the semi-windup stage, speculation is rife—which means that occasionally somebody asks a question—about what the end product of the whole Docket G-580 investigation is destined to be.

Contrary to the opinion that seems to be common in the industry, and despite our own earlier expressions on the subject, we have now come to believe that in the long run the hearings may amply justify the time and expense that have been put in on them.

It is true that the record of direct testimony and cross examination will be found to be heavily smudged by the soot and grime of industrial, regional and class self-interest and greed. We are talking about the opposition of course. It was surprising to see how clean our boys looked with their newly starched Buster Brown collars as they weighed the solemnity of their oaths and then stood up to testify.

It is true that thousands of pages of testimony and exhibit will be found to be irrelevant, specious and shoddy—arguments advanced in some cases to bolster up *a priori* opinions, and in others to give the lawyers an opportunity to keep on talking from the spacious comfort of their richly upholstered *per diems*.

It is true that the united front finally shown by the natural gas industry was considerably more apparent than real, and that in the last analysis the case put on by the industry was a case for the pipe line companies, and bore but scant relation to the interests and problems of either the gas producers or the gas distributing companies, except to the extent that those interests were identical with those of the transporters.

We believe that a more detailed analysis of the value of gas produced, with particular reference to the field prices paid to independent producers, would have been of interest and value in rounding out the natural gas case. Witnesses representing other than industry interests, on numerous occasions, made a strong point of the necessity for adequate field prices if gas conservation is to be made economically feasible. Omission of an industry expression on this point left a ragged gap in the gas case.

All of these things are true enough; and it is also true that a great many more patent and obvious faults could be found—faults in both the plan and the execution of the proceedings. But these shortcomings must be no less obvious to the members of the Federal Power Commission; and as its members weigh and digest the testimony already incorporated into the record, we have no doubt that they will make due allowances for facts conveniently ignored, just as they will have to scale down the significance of those which by one side or the other have been disproportionately emphasized.

But the benefits to be derived from the investigation—benefits to the industry and to the cause of just and equitable regulation in the best public interest—can in the long run outweigh the cost and the inconvenience that its long course has occasioned. And that opinion is precisely opposite to the one we entertained when the Docket G-580 enterprise was first announced.

There now rests on the Federal Power Commission a heavy responsibility to digest, codify, assimilate and then apply all of the facts that it has had presented to it during the past 11 months. The determination and the fortitude with which the commission and its staff now undertake and follow through this self-imposed assignment will be the final measure of the value of the investigation. With over 13,000 pages of transcript taken, and 450 exhibits entered as of the third week in July, it is obvious that just the mechanics of reducing the mass to a form suitable for reference and study will be monumental. This is a responsibility which we believe the investigators recognize.

Once the indexing of the entire hearings has been accomplished, the FPC will have in its records, and available for study, the most complete set of data ever assembled on the natural gas industry.

As a result of its patience and forbearance with the coal and railroad intervenors, the FPC has heard every variety and shade of social, economic and psuedo-economic justification for restrictions on the expansion of natural gas into areas now limited largely to the use of coal or gas made from coal.

It has had presented, in more or less elaborate form, the views of every gas producing state and every important state regulatory body on the subject of its success or failure in controlling or preventing the waste of gas.

The interests of consumers in continued usage of natural gas have been amply indicated by the presence of large numbers of witnesses who appeared voluntarily in behalf of the gas industry. That they will be arbitrarily restricted to the use of solid fuel by federal fiat seems unthinkable.

Utility commissions, charged with fixing rates and conditions of service in the consuming states, stated their opinions on the line that should be drawn between state and federal areas of authority. They were unanimous in their view that the function of the federal agency was to supplement and bolster, rather than to supersede the authority of the state bodies.

Out of all of this welter of opinion and fact the commission will ultimately be obliged to come up with a concrete report suitable for presentation to the Congress, if for no better reason than to justify the appropriations that it has been given to carry on the activities.

Speculative interest, now, is on what sort of report will be rendered, what recommendations made, if any, for amendment to the Natural Gas act, and whether a more expeditious policy will be adopted by the commission toward its administration of the act as it now stands.

A full report on the investigation to Congress will of necessity be delayed until after fall elections by the very bulk of the material that will have to be digested. It is currently being said that the commission has its report already partially prepared. Of this we are skeptical. Certainly it must recognize that the congress will not

regard any hastily trumped up quickie, issued without time for ample study, as an adequate presentation of the national fuel problem, of which gas is but a part. The commission may soon be in a fight to retain its position as the natural gas authority of the federal government, independent and autonomous as it presently is, with responsibility to no cabinet officer. It is unlikely under these circumstances that it will gamble away its new blue chips, the knowledge it has gained of natural gas, in anything less than a full-scale deluxe presentation that will reflect the greatest possible credit on the commission, its competence and its sound judgment.

Whether or not the report to Congress will contain specific requests for additional powers to be granted under amendments to the Natural Gas act will depend, in our opinion, on the political trends shown by the fall elections, and by the political tone of the new congress.

It is currently supposed that the commission is particularly desirous of establishing jurisdiction over direct pipe line sales to industrial users of gas. But we believe that before this question can be put up to Congress it will have become apparent to the commission that regulation of direct sales, if it is to be exercised at all, will have to be under the jurisdiction of the utility commissions of the consuming states. For the FPC to take that stand at the outset, rather than wait until it had lost out in another unsuccessful grab for power before Congress, would be in accord with state commission views. It is an attitude that would undoubtedly go far toward mitigating the suspicion with which the National Association of Railway and Utility Commissioners has lately come to view the federal agency.

It is highly probable that the day is not far distant when most if not all new interruptible industrial gas sales will be made through the distributing companies, with unregulated pipe line deliveries confined to service and connections already in force.

In the matter of conserving natural gas through the regulation of production and gathering, we believe the commission has had a liberal education along lines of thought that it had not heretofore thoroughly explored. It has been persuaded, we believe, that state conservation measures are yearly becoming more effective, and that no new restrictions can be put on gas production by any agency that does not have a similar authority over the production of oil.

In view of the evidence so ably presented on this subject the FPC may quite conceivably return to the view that it expressed in 1940. Then, in the famous Columbian Fuel Corp. case, the commission refused to regulate field prices, saying that to do so would "lead the commission into attempts to deal with the complicated interrelations between the natural gas industry and the oil industry."

As a result of the evidence shown, and the various representations of the oil and gas producing states, we believe the commission will lend its weight to the support of federal measures designed to strengthen the hands of the state conservation commissions. Whether it will call for the declaration of a federal policy on oil and gas production, or whether it will back the extension of the Connolly Hot Oil Act principle to include natural gas, is another decision that may be strongly influenced by the political weather that prevails after the Congressional elections. Here again we believe that the commission may ultimately decide that it can accomplish most for conservation by moving to supplement and strengthen state authority, rather than by attempting to usurp it.

As to the discharge of some of its presently neglected duties under the act, it was apparent that the commission heard with an attentive and open mind the gas industry recommendations made early in the Washington hearings, i.e., that it: (1) Proceed with service area determinations as expeditiously as possible; (2) Move to minimize the expense and delay caused by wholesale routine interventions in rate cases; and (3) otherwise simplify its certificate procedure.

The inquiries addressed to natural gas companies, inviting expressions of opinion as to their proper service areas; the number of certificate applications granted within the past few weeks; and the tone of a recent order announcing that one application would be disposed of if "a protest or petition to intervene in the judgment of the commission raises no issue of substance," all lend confidence to our belief that the commission is determined to streamline its administrative procedure as far as it can and as rapidly as possible, under the terms of the act.

## Bids For Big Inch

SEVENTEEN bids for outright purchase or lease of the Big Inch and Little Big Inch pipe lines were given public reading the morning of July 31 by the Office of Real Property Disposal of the War Assets Administration in Washington, D.C.

Although most of the bids on the 1340-mile Big Inch and the 1475-mile Little Big Inch specified that they were to be used for the transmission of oil, several proposed to transport gas and some of the oil proposals named gas as an alternate use.

Bids were listed as follows:

John Bauer, New York, for a cooperative sponsored by Thurman Arnold and Abe Fortas; for petroleum use, gas as an alternate—$70 million.

Big Inch Oil, Inc., New York; for petroleum, gas as an alternate—$110 million.

Big Inch Natural Gas Transmission Co., District of Columbia, for gas—$85 million.

W. Lee Clements, Barton, Ark., marketing cooperative—to lease for oil and gas at 7% less 4% depreciation annually.

J. W. Crotty, Dallas, Texas; Big Inch for gas, Little Big Inch for oil—$127.5 million.

L. M. Glasco, Dallas—to lease Little Inch, relay from Permian Basin to California at 5 cents per bbl rental.

Frank W. Craw, Anniston, Ala., for oil, $146 million less depreciation.

Petroleum Royalty Corp., Dallas, lease for oil at 15% of gross.

Ryford Pipe Line Co., Chicago, backed by independent refiners, IPAA, and Mid-Continent—for Little Big Inch, $30 million, for oil; would accept Big Inch for $40 million, if required.

Sinclair Refining Co., bid for New York Pennsylvania feeder lines for oil.

Transcontinental Gas Pipe Line Co., District of Columbia, $85 million, for gas.

Syndicated Industries, Inc., New York, for oil—would lease at ½ cent per bbl.

Glen McCarthy, Houston, Texas, for gas—$80 million.

Noyack Oil Corp., Tulsa, Okla., for oil—$80 million.

Russell Palmer, Washington, for oil; to convert to gas if necessary—$135 million.

E. Holley Poe, New York, for lease at $260 million or purchase at $80 million plus $20 million deferred payment.

E. DeGolyer, Charles I. Francis, Herman Brown, George Brown, for gas—$260 million on lease or $100 million.

# Highlights

• The appearance of eight U. S. Bureau of Mines witnesses before the Washington hearings of the natural gas investigation may be of more than passing significance. BM testimony steered a neutral course in coal vs. oil market controversies, but witnesses amply demonstrated the Bureau's broad interest in, and knowledge of, the whole field of national fuel problems. The evidence tended to support the contention made by the Interior in April, 1944, when it advised the House Interstate Commerce Commission that the Bureau of Mines and Biological Survey should be entrusted with the natural gas study on the grounds that much of the information sought after is already available in that department.

• Effective July 11, and until April 30, 1947, Peoples Gas Light and Coke Co. has advised all Chicago heating contractors, builders and architects that no new space heating installations will be accepted by the company. Reasons assigned are twofold: (1) The impossibility of getting materials for new pipe line construction, and (2) the greatly increased demand for gas by existing cooking, refrigeration and water heating customers. Heating contracts already entered into will be honored.

• The Louisiana legislature has tabled for this session a measure proposed by Col. P. A. Frye, Executive Director of Natural Gas Conservation for Louisiana, to increase the gathering tax on natural gas from its present ½ cent to 3 cents per Mcf. Another measure calling for a gas sales tax of 1½ cents per Mcf was defeated.

• For the first time, FPC has given indication that intervenors in opposition to natural gas certificate applications must have some basis for their protests. On a recent application by Cities Service for a small extension, the commission announced that it would dispose of the application "if a protest or petition to intervene, in the judgment of the Commission, raises no issue of substance." This may or may not mean that the routine obstructionist tactics of the coal and labor groups will have to be based on more substantial issues than they have in the past.

• "It is the belief of technologists associated with the Bituminous Coal Research that important advances in coal processing and gas manufacture from coal are not only possible but will be achieved if an adequate amount of coordinated research and commercial development is done in the next ten years."

Dr. Harold J. Rose, vice president and director of research, Bituminous Research Inc.—Before FPC Hearings.

• Testifying in Washington, Roy A. Wehe, assistant director, Public Utilities Department, California Railroad Commission, gave as his opinion that since the FPC is without jurisdiction over direct industrial sales, the interests of gas conservation would indicate that such jurisdiction should be claimed by the states.

• "Presently proved fuel reserves of the United States—solid, liquid, and gaseous—may be summarized as amounting to the energy equivalent of 2.6 trillion tons of bituminous coal having a heating value of 13,000 Btu per lb."

Arno C. Fieldner, chief, Fuels and Explosives Branch, Bureau of Mines.

• P. C. Keith, president, Hydrocarbon Research, Inc., testified before the Washington hearings of the FPC that fuel reserves of the United States, if converted into crude oil, would make a total of 6326.1 billion barrels divided as follows: Crude oil, 21.1 billion; from natural gas, 25 billion; from coal, 6280 billion.

• "It is today technically feasible to manufacture methane from coal and, if desired, a gas with a heating value considerably higher than that of methane can be made . . . With certain contemplated improvements now actually the subject of advanced research, the cost of synthetic gas might easily be brought *below* the delivered cost of natural gas in many areas of this country."

M. K. Lewis, professor of chemical engineering, Massachusetts Institute of Technology.

• Welcome indication of the FPC's determination to get on top of its accumulated docket was evidenced in press releases dated July 9-13 in which eight certificate applications were approved authorizing the construction of nearly 1000 miles of pipe lines ranging in size from 12½ to 26 in., at a grand total cost on all projects of $46,511,859, the cost including in most instances additions to compressor stations and other facilities. The biggest authorization in the group was on Tennessee Gas & Transmission Co.'s application to increase by approximately 118 MMcf per day the capacity of its main pipe line system from Driscoll, Texas, to Cornwell, W. Va. Facilities planned on this job include 410 miles of 26-in. and 24-in. main line looping and approximately 20 miles of lateral feeder lines. Three new compressor stations totaling 25,000 hp and 18 additional compressor units for existing stations aggregating 19,000 hp were included in the authorization of the project, estimated to cost $27,405,717.

• The Gas Appliance and Equipment Manufacturers Association reports that 120 manufacturers have signed up for 52,636 sq. ft. of space in GAMA's Atlantic City exhibition, to be staged the week of Oct. 7. Space contracted for represents 73% of the total footage available and nearly 100% of that occupied at the last show held there in 1936.

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# WASHINGTON WINDUP

By ELLIOTT TAYLOR, Editorial Director

## FPC Natural Gas Investigation Hearings Drawing to a Close

**Docket G-580's final hearings become political catch-all . . . fact, theory, and prejudice parade before the bench . . . obstructionists outnumber gas proponents . . . railroads reiterate fear of revenue losses . . . the gas industry's four-point stand . . . coal interests harp on "waning gas reserves"**

THE closing hearings in the Federal Power Commission's Docket G-580 investigation of the natural gas industry have taken on something of the aspect of a political and economic catch-all into which every variety and shade of fact, opinion, theory and prejudice affecting a possible national fuel policy has been dumped with indiscriminate and often irrelevant abandon.

While the Washington hearings, which opened in the national capitol on June 17, had been anticipated as the time and place for a summarizing and interpretation of the facts gathered during the ten months of intermittent field hearings it early became apparent that a reiteration of the contentions already advanced, by friends of the gas industry and by its adversaries, rather than a review of their significance, was to be the main preoccupation of the windup witnesses for both sides.

### Gas Proponents Outnumbered

Of the 47 witnesses who testified before the commission during the first four weeks of Washington hearings, 31 could be classified as being sponsored by, or submitting testimony favorable to, the natural gas obstructionist groups of coal, railroad and allied interests, six were from the U. S. Bureau of Mines, with testimony that in the main retained a detached technical viewpoint not slanted to the partisan position of either side, and 10 were outright exponents of the doctrine of minimum federal regulation of natural gas affairs.

The railroad position, and the arguments introduced to bolster it, were comparatively simple. The railroad contention has always been that the hauling of coal is too big a slice of railroad revenue to permit it to be lost to the transportation of fuel through natural gas pipe lines without a fight.

### Outright Commitment Avoided

The self-evident fact that coal is a big income factor in railroad operation was presented in statistical form, and the conclusion drawn that the maintenance of an adequate transportation system is heavily dependent on a continued coal movement. In the main, however, railroad witnesses were reluctant to give an all-out endorsement to the principle of federal intervention in the normal competition between

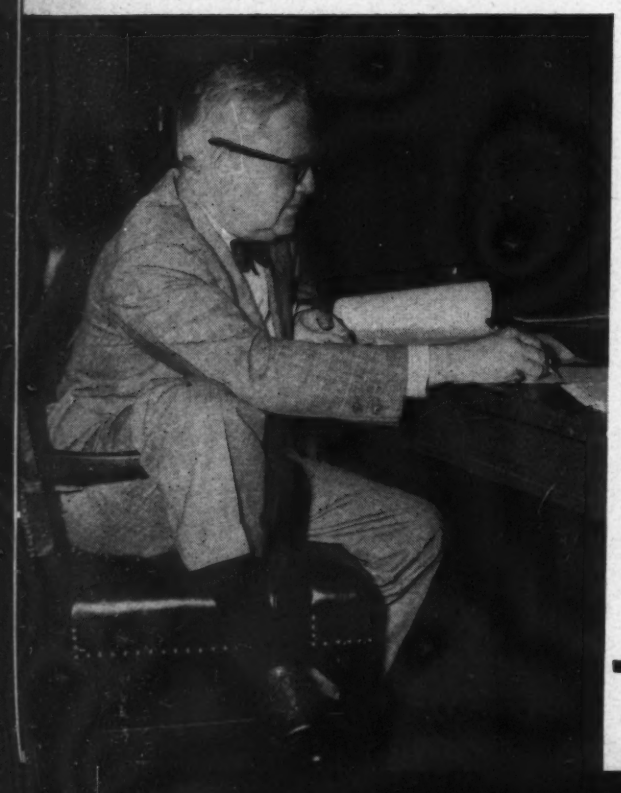
Shown at the trial bench in the above photo are Nelson Lee Smith, supervising commissioner of the Natural Gas Investigation, at left; Marvin Farrington, FPC trial examiner; Leland Olds, FPC chairman; and Harrington Wimberly, commissioner.

Seen at the counsel table and in the section reserved for observers are: foreground, William Lyons, FPC engineer, Washington, D.C.; FIRST TABLE, from left, Burton N. Behling director of Natural Gas Investigation, FPC, Washington; Frank Field, FPC atatorney, Washington; Charles I. Francis, special counsel, Texas governor's steering committee, Houston; Don H. Culton, Natural Gas Industry Committee attorney, Amarillo, Texas. CENTER TABLE: Left to right, D. H. Linton, Eastern Gas and Fuel Associates, Boston; E. L. Richardson, assistant atty. genl. of Louisiana, Baton Rouge; John A. Gage, Eastern Gas and Fuel Associates; Amos A. Mathews, Association of American Railroads, Chicago; R. W. Peterson, Wisconsin Public Service Commission, Madison; T. J. McGrath, attorney representing coal and railroad labor unions; and H. J. O'Leary, Wisconsin Public Service Commission.

gas and coal. Even under the leading cross-examination which has characterized all of the hearings, testimony sought to avoid outright commitment to a managed fuel economy.

The coal industry's presentation, although highly repetitious, was established on a broader economic base than was that of the railroads, and it carried with it considerably more of an air of economic authenticity. By admitting first of all that gas is a superior fuel, witnesses were thus able to argue consistently that it should be conserved for superior uses. In general the definition of these uses developed to be in the supplying of the domestic and light commercial loads in areas where both coal and gas are available, with boiler fuel and heavy industrial sharply proscribed or prohibited entirely except in areas immediately adjacent to excess gas production.

Geologist and natural gas reserves expert Dr. E. Golyer, Dallas, Texas, preparing his rebuttal in cross examination at the Washington hearing.



### Coal Interests' Stand

The adverse economic effect of the loss of coal gas and coke oven gas markets was delineated in terms of (1) immediate unemployment, (2) economic disruption of the primary coke by-products industry, and (3) the dislocation of the mining industry to the detriment of national safety. In addition, hundreds of pages of testimony and transcript sought to picture natural gas as a waning resource that should be conserved for the comfort and convenience of future generations.

Any testimony tending to minimize the necessity for holding the natural gas reserves under strict regulation was discredited as far as possible by the gas obstructionist legal staff.

Despite their obvious stake in the future of any gas-from-coal processes, coal witnesses in the main expressed doubt as to the economic feasibility of any methods other than those already in use, although it was admitted that little coal-sponsored research into the making of high Btu gas had been undertaken. Representatives of the management side of the coal industry were also loathe to openly espouse further governmental control over the gas industry. Representatives of coal labor groups, however, were disposed to favor any method of obstructing natural gas extensions, provided only that the end result proves satisfactory to their interests.

### Gas Industry's Case

The natural gas industry case, as presented under the general auspices of the Natural Gas Industry Committee, took its first definite form in the Washington hearings. Upon conclusion of the case, probably by Aug. 1, from ten to twelve witnesses will have been presented. Their testimony, some of which has already been taken by the commission, will revolve around four major contentions:

1) *That natural gas industry has a proven record of dependability in the public interest.*
2) *That the public interest will continue to be best served by an uninhibited industry operating in a maximum of responsiveness to economic laws.*
3) *That the natural gas supply is adequate to meet all of the foreseeable future demands for this type of energy fuel.*
4) *That the administrative problems posed by necessary regulation can best be solved by cooperative measures.*

Papers prepared by witnesses appearing either as individuals or as industry-sponsored witnesses can all be grouped under these headings. At the present writing not all of the industry testimony has been officially presented.

On the *industry record, (1)* the lead off presentation was made by E. Holley Poe, who traced the development of natural gas service, and in so doing compared its record of service to that of its principal detractor, the coal industry. In the same vein, two papers, "Natural Gas as a Factor in Location of Industry" and "Natural Gas Utilization Statistics," were ready for presentation by H. Zinder. Also scheduled was a paper, "Consumers Interest in Industrial Load," by S. Barry Flagg.

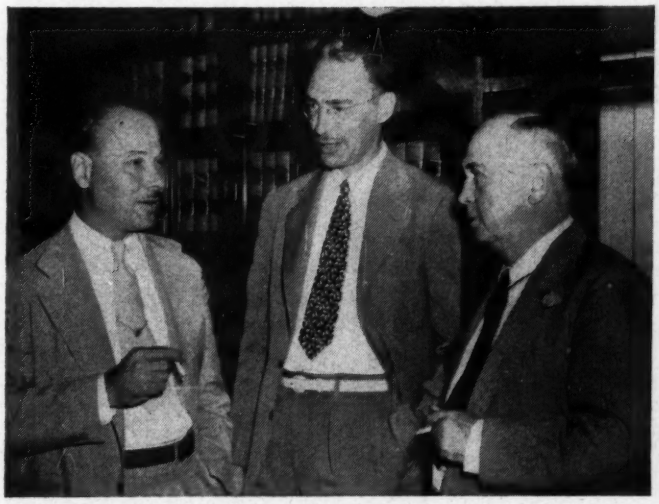
The relationship of *public interest to the free play of economic laws (2)* was to be treated by three witnesses: J. E. Flanders, presenting "A Case Study in the Transportation of Natural Gas," and "Cost Behavior in Natural Gas Transmission," develops the relation between pipe line load factor and the cost of gas delivered from the line. Two papers by Charles R. Bellamy, "Industrial Utilization of Natural Gas" and "A Case Study of Natural Gas

# GAS MEN
## At the
# FPC HEARINGS
## Washington, D.C.

Gas men who were interested observers at the Washington hearings included Elliott Taylor, editorial director, GAS, at left; Robert W. Hendee, president, Colorado Interstate Co., Colorado Springs; H. Carl Wolf, A.G.A. managing director, New York; and George H. Smith, assistant A.G.A. managing director and director, Natural Gas Dept.

Shown at the gas industry counsel table are John A. Ferguson, secretary of the Independent Natural Gas Association, Washington, D. C., and Wesley E. Disney, who is chief counsel of the Natural Gas Industry Committee.

Waiting their turn to testify are H. Zinder, associate of E. Holley Poe, John Murrell, of the firm of DeGolyer and McNaughton, Dallas, Texas, and E. Holley Poe, natural gas consultant of New York City.



During an intermission H. Zinder, rate expert and Industry Committee witness, chats with Walter E. Caine, director, A.G.A. Statistical Bureau, and Basil Manly, vice president, Southern Natural Gas Co., former FPC chairman.

Proponents of increased FPC jurisdiction—three Louisiana representatives, P. A. Frye, executive director, Natural Gas Conservation; E. L. Richardson, assistant state atty. general; Sam H. Jones, ex-gov., member, Interstate Compact Commission.

Distribution," follow through with the argument for economic determinism. The former presents the basic principles which govern the acceptance of a fuel, particularly by industry, and the latter traces the natural gas transmission cost behavior study, as presented by Flanders, through to an analysis of its effect on rates to domestic consumers.

The hotly debated question of the *adequacy of the natural gas supply* (3) is being attacked from two standpoints. E. DeGolyer, geologist and authority on reserves, has already presented, and in Washington again reiterated confidence in, his studies showing that so long as new discoveries exceed withdrawals, it is impossible to regard natural gas as approaching exhaustion in any foreseeable period of time.

### Life of the Market

Related to the predictable longevity of the natural gas supply is the question of the probable life of the market that it alone can serve most advantageously. A paper "Replaceability of Natural gas," by W. K. Lewis, professor of chemical engineering at Massachusetts Institute of Technology, outlined the early possibility of making low-cost high Btu methane gas from coal, a subject that had been treated at an earlier date by P. C. Keith, developer of the Hydrocol process. "Industrial Atomic Power," a paper by E. R. Gilliland, also a professor at M.I.T., foresaw the development of an entirely new form of power through the use of atomic energy, a possibility that invites serious speculation for the advisability of restricting present day use of natural gas on the grounds of its future desirability. Many witnesses during the hearings have implied that natural gas may well be superseded or outmoded by superior energy forms before the present known supply can be marketed.

The entire gamut of *administrative problems* (4) posed by federal and state regulation, and the development of the theme that only cooperation between government and industry can solve those problems in the highest public interest, was the subject of the remaining papers scheduled for delivery by industry representatives. Somewhat critical in tone, a paper by E. Buddrus, president of the Independent Natural Gas Association, was slated to discuss from pipe line management's standpoint "The Natural Gas Business Since the Passage of the Natural Gas Act." R. H. Hargrove, vice president and general manager of the United Gas Pipe Line Co., outlined the "Administrative Problems under the Natural Gas Act from the Viewpoint of an Operating Company Official."

The theme of successful local measures to prevent waste was discussed under "State Conservation Laws," by John H. Poe, Tulsa oil and gas attorney, who also supplied the commission with "A Compendium of Gas Conservation Laws."

### Crosby's Recommendations

The immediate and long range implications of industry and commission cooperation was summed up in two studies, "A Survey of Federal Regulation of the Natural Gas Act," and "The Natural Gas Act and its Administration," by S. H. Crosby, counsel for E. Holley Poe and Associates, and a former member of the legal staff of the Federal Power Commission. The concrete recommendations made by Judge Crosby, and concurred in by the Natural Gas Industry Committee (See GAS Magazine, July, P. 21) are not represented as the sole and final views that the industry may express, but at the present writing, they are conceded to constitute the best interim program which both the federal agency and the natural gas industry can support.

## FPC Governs 29% of Gas Output

THE relatively small volume of natural gas that comes under the jurisdiction of the Federal Power Commission was pointed out by E. Holley Poe, natural gas consultant of New York, when interviewed by GAS Magazine shortly after he had completed his testimony at the Washington hearing in the Federal Power Commission's investigation.

"Something less than 29% of the total marketed production of natural gas in 1943 came under the jurisdiction of FPC," Poe commented.

"I say something less than 29% because a further deduction should be made for the gas sold in interstate commerce directly from pipe lines for industrial purposes, but it is not possible to obtain data for that category of gas sale."

The Federal Power Commission is concerned only with that small part of the gas industry's activities, Mr. Poe commented, despite the wide scope of its interests as indicated by the current investigation under Docket G-580.

In support of the calculation of 29%, Poe referred to Bureau of Mines data for 1943, the latest year for which interstate shipments data are available, and made this summary:

| | |
|---|---|
| Marketed production | 3.4 trillion cu. ft. |
| Less gas used in the manufacture of carbon black and in the field | 1.0 trillion cu. ft. |
| The remainder, which could be classified broadly as pipe line gas | 2.3 plus trillion cu. ft. |
| Interstate shipments and exports to Canada and Mexico, included in figure above | 1.0 trillion cu. ft. |

Calculations showed that the interstate shipments and exports were 29% of the total marketed production.

Some indication of the volume of gas that is sold directly for industrial purposes was obtained from the Federal Power Commission, but their figure does not distinguish between interstate and intrastate shipments.

Under the Federal Power Commission's classification of "main line industrial sales not made through distributing companies," on their Schedule 428, FPC found that 482 MMcf, or about one-half trillion cu. ft., were accounted for in 1943.

## Tulsa Short Course on Appliances Attracts 200

A FOUR days short course on gas appliances, first of its kind in Oklahoma, sponsored by the University of Tulsa, Tulsa, Okla., June 11-14, attracted over 200 registrants. The attendance was comprised principally of executives and employees of natural gas utilities and appliance dealers and distributors in Oklahoma and surrounding states.

Since utility companies cannot merchandise appliances in Oklahoma under a state law passed several years ago, instructors on sales subjects were drawn from other states or from Oklahoma natural gas equipment and appliance distributors and dealers not connected with the utility industry.

Oklahoma gas utilities executives, however, helped to organize the course and gave liberal support with speakers and attendance. They cooperated with Dr. F. T. Gardner, professor of chemistry in the College of Engineering, to establish the courses.

# The Gas Company Executive

# AT THE BARGAINING TABLE

By O. C. COOL,

Director, Labor Relations Institute, New York

MODERN labor relations techniques or collective bargaining between gas executives and independent local unions—as for all other industries—trade off essentially upon horse-trading strategem. However, far too many strongly individualistic employers in the gas utility field still resort to horse-and-buggy methods in this day of the streamlined machine.

A recent example of this comes to mind. The owner of a medium-sized gas company was in New York over the week-end and stopped off to pay me a visit. In his own words, "I want to find out just what all this labor relations stuff is getting at." He confessed that he was at a loss to understand why people made so much fuss about collective bargaining, "After all," he pointed out, "isn't it largely a matter of common sense?"

I admitted that it was, to a large extent, a matter of common sense to know what to give and what to take in collective bargaining with a union. I added, however, that a large number of employers approach collective bargaining backwards. They wait until a session commences before beginning to horse-trade.

"Are you aware," I asked, "that unions spend as much as three million dollars a year just doing advance research for collective bargaining? Do you know also that in one case the union went so far as to check on how much money an employer's wife spent for a mink coat—the better to show to advantage in a bargaining session later?" My guest expressed incredulity.

The point I wish to stress here is simply this: If the union takes so many pains in advance to win, isn't it wise for the employer to prepare just as carefully in advance before he sits down to collective bargaining?

### Know Your Contract

A cardinal principle in all collective bargaining is to *get your facts and figures in advance.* Know your union contract inside-out before you go to the bargaining session. Take special pains to get a rounded picture of wages, hours, working conditions and other essential points by getting information from other companies in your industry and area.

Some employers take the position that facts and figures prove nothing. They point out that the union is likely to discard them entirely when the heat is on and confine bargaining to a struggle among personalities. In handling negotiations for scores of companies, I have worked assiduously to convince employers that such a practice is playing into the union's hands, that without essential figures a bargaining get-together will be reduced to an emotional struggle and a bad basis of bargaining will be established as a result. Facts follow reason. The more you can collect and prepare beforehand, the more weight your arguments will have.

By far the wisest policy to be followed on this was stated to me by one employer as follows: "I've found that figures often swing the balance in the heat of debate. I know that unions, whether they use figures or not, have certainly collected them and studied their strategy on that basis in advance. For this reason, my policy is to gather my data regardless of whether a bargaining session is around the corner or not."

Two pointed observations, however, must be borne in mind in presenting facts when negotiating a dispute. One is to have them so prepared that they are *dramatic and simple*—not confusing. The other is to present them with the *proper timing.* In other words, the employer should rely upon facts to supplement his main demands and counter-demands.

**HORSE-TRADING has outgrown horse-and-buggy methods, and even though it is still the basic strategy used in collective bargaining, plenty of forethought and preparation on the part of the employer is required if he is to cope with the streamlined dealing of the modern labor representative.**

O. C. Cool

**When the union spends as much as $3 million a year just doing advance research for bargaining, why shouldn't the employer prepare his case just as carefully? asks Mr. Cool, who has negotiated over 500 union contracts since he first became engaged in labor relations work.**

**Working as a management representative, the author is the head of the Labor Relations Institute, an organization which services over 7500 companies in 75 industries, and which he founded in 1938. Mr. Cool's philosophy in collective bargaining is that the contract should be simple to read and easy to understand. Indicative of the respect he has won from labor is the fact that recently a union, on strike against a plant for four months, returned to work upon learning that Mr. Cool had been called in by management to negotiate. Within five days a satisfactory settlement was made.**

### Know the Trader

A shrewd "horse-trading" maxim often overlooked by the smaller employer is to know the other horse-trader as well as the horse. Know the union negotiators in advance. whether they represent the CIO, A.F. of L. or independent organizations. Take the trouble to find out how they tick —their personality, mentality, past records, authority, techniques. I have often encountered union negotiators who are merely mouth-pieces without any authority to make concessions. If this is true, you can save much valuable time by making your proposals and counter-proposals tersely and saving your wind for the later, more important, sessions.

Another clever union strategy—employed just as often by independent unions as by the CIO or A.F. of L.—is to come up with a "talk-turkey" type of negotiator. His main function is to get sarcastic and belligerent and thus prod you into taking a position early in the proceedings. After he has fulfilled his special role, negotiators with more authority take over and you may find yourself with two strikes against you in the first inning.

The "show-anger actor" is also used by unions to good advantage. He has been carefully coached in advance to display all the mannerisms of anger open to human imagination. He'll roll his eyes, grit his teeth, change color often—all a part of an act designed

to catch you off guard. If unions go to all such lengths to win, isn't it just as necessary for you to know about these tricks in advance?

Many small employers prefer to do their company's bargaining with the union alone. This carries with it some dangers. The employer may likely find himself dealing with a union representative who is specially trained just for the job of negotiating. Moreover, the union man has no doubt dealt with many employers in his time. Thirdly, the employer has not had time to delve into the strategies of bargaining, or to familiarize himself with all the special details necessary to have at one's fingertip. For these reasons, it is important to call in a trained negotiator on your side—one who can match, or over-shadow, the experience of the union representative.

### Lone Bargaining Unwise

At best, individual bargaining is generally considered unwise by most executives. Group thinking, it has been proved over and over again, saves time by getting more heads together on a number of perplexing issues. This does not mean, however, that the employer should select a few friends among the company officers and have them "sit in." You should have at least one person on your side who is completely familiar with working conditions and who can provide a check and counter-check on points raised by the union. Failure to provide for this "brake" to union charges may make you the victim of a union steamroller.

It is wise, too, to have a company negotiator present who will actually administer the operation of the contract after it is worked out. This person should act as a check against any agreement which might not work once it's put into effect due to some plant peculiarity not know to the employer.

In bargaining of this kind, be sure to assign all the company representatives a specific role in the discussion. A good idea is to divide up the subject to be taken up, with each company negotiator acting as "expert" on one phase.

On the other hand, I have found employers who prefer to let their subordinates handle all negotiations for them. In this case, it is important to have somebody of high managerial status so as not to be union-outranked. This little trick may appear silly on the surface. It carries with it a shrewd understanding of people. When a union sees that the opposition lacks sufficient status, its negotiators are likely to push through and "take another inch."

In the actual rough-and-tumble of the negotiations, the employer is not confined to presenting counter-proposals to union demands entirely. The union likes to insist on this point and probes to see if it can get away to a fast start through use of the technique. However, there is nothing to prevent the employer from bringing in his complaints and grievances against the union. These, thrown skillfully into the fray, often prevent the union from seizing the offensive and never relinquishing it.

### Discuss All Points

Come into the affair prepared for another trick or two. One is when the union suddenly drops all other demands and concentrates on one big issue—after management has tipped its hand. Your procedure here is to discuss each provision separately on its own merits and come to a tentative agreement on each one until all points of dispute are covered. Then —with all the details filled in—the employer can reach a final conclusion.

Also, the union works through the system of a bargaining range—and a common technique, particularly on the question of wage demands, is to alarm management by shooting 50% or more over the desired goal. It is best to anticipate such unreasonable demands and come back with an unreasonable counter demand of your own, or appeal to the opposition's sense of fairness. I once urged an employer faced with such a predicament to hint at publicizing all facts of the case. The union quickly tempered its position.

### Time Factor Important

Finally, the employer should give some attention to making the meeting place as comfortable and informal as possible. Provide ash-trays, good light and ventilation, adjoining recess rooms if possible.

One last word—watch out for the time arrangement. The union wants to get an employer during his busy season, the more to hang the strike threat over his head. An easy compromise can be reached at this point. Morning sessions have been found to be far and away the best for alertness. After-hour sessions are still in common practice, but these lead to early fatigue and much wasted time.

In conclusion, it is wise for the gas executive to give some careful consideration to the working principles of labor relations to keep abreast of the times. Attention to such pointers as I have indicated and a conscientious effort to keep informed on the latest techniques will in the long run do wonders to an employer's understanding of what, exactly, constitutes "common sense" today.

# Proposed 3-Month Interruption of Gas Service Protested by Arkansas

A protest against the threatened cut-off of natural gas service of the Mississippi River Fuel Corp. to its interruptible customers in eastern Arkansas for three or more months next winter has been filed with the Federal Power Commission by the Arkansas Public Service Commission. More than 20 Arkansas cities and towns and 30 large industries, chiefly rice driers and rice mills, would be affected.

The corporation, which has headquarters in St. Louis, Mo., distributes natural gas to Arkansas customers through the Arkansas Louisiana Gas Co. and the Arkansas Power and Light Co. Service is on an interruptible basis in the area affected, and gas is sold at cheaper wholesale rates than those provided under an assured supply agreement. Arkansas consumers have been cut off for only three- to five-day periods in the past.

Commissioner R. B. McCulloch of the Arkansas regulatory body charged in his protest to the FPC that the proposed cut-off will be effected to increase Mississippi River Fuel's distribution in the St. Louis area, and asked revision of the corporation's application for permission to enlarge its pipe lines through Arkansas, in order to include provision for adequate service in the state.

Arkansas industrial consumers have either shut down or have used butane gas during short service cut-offs in the past, but cost of butane during a long period would be prohibitive, he said.

At an FPC hearing in St. Louis recently, sales executives of Mississippi River Fuel said the concern expects to double its sales to utilities distributing natural gas from its pipe line on a "firm" or assured supply basis within the next five years.

The "Batesville Guard," daily newspaper published in Batesville, Ark., one of the affected towns, suggested editorially that if the corporation attempts to carry out its plan to discontinue interruptible gas service to Arkansas consumers, the 1947 legislature should levy a confiscatory tax against the company's pipe lines and property in the state.

# Use of Liquefied Petroleum Gases for

# Reforming and Cold Enriching

## A Case History Covering 15 Years of Operation at Waterbury, Conn.

By H. M. KOPP, General Engineer,

Connecticut Light & Power Co.

H. M. Kopp

**AN EVALUATION of the benefits as well as the shortcomings of using liquefied petroleum for reforming and cold enriching of gases is detailed in this paper by the author, who has spent 15 years at the one plant, supervising and developing from birth the operation of the company's liquefied petroleum installation. Starting with two 25,000-gal. storage tanks and accompanying equipment, the Connecticut Light & Power Co. made its first butane installation at Waterbury in 1931, in order to increase the capacity of the coal gas plant. Since that time, the author has added facilities for reforming butane-steam mixtures in coke ovens, and for reforming butane and propane in carburetted water gas sets. Five tables show the results of the operations.**

**Prior to joining CL&P in 1930 as general engineer, the author spent 11 years in the Waterbury Gas Light Co., starting in 1919 as a works chemist and emerging in 1930 as superintendent of manufacture. He had experience as an assistant electrical engineer with General Electric from 1915 to 1918, although his service with the company was interrupted for a spell of active duty as a navy ensign in World War I.**

IT can probably be said without fear of contradiction that The Connecticut Light & Power Co. at its Waterbury gas plant has had longer and more varied experience with so-called liquid petroleum gases than any other manufactured gas plant in the country. Practically all of the tests and operations were developed by the writer and were made under his direct or indirect supervision. In view of the present great interest in liquefied petroleum gas for peak load purposes, particularly to reduce excessive plant expansions required for the winter house heating demands, it seems fitting that a review of appications and progress should be made at this time.

No attempt has been made in this paper to cover the chemical reactions taking place in the various steps of reforming steam and butane or propane. They are very complicated and much has been published along that line. As far as the writer is aware, however, the heat required for these reactions is still a matter of controversy.

The laboratory of the Connecticut Light & Power Co. at Waterbury is very well equipped for gas analysis and the samples for the sets were obtained in a small gas holder equipped for the purpose.

### Cold Enriching Coal Gas—Producer Gas With Butane

The first butane installation was made at Waterbury in 1931 for increasing the capacity of the coal gas plant. It consisted of two 25,000 gal. storage tanks for working pressure of 125 psi and was equipped with liquidometers, safety valves, safety checks and heating coils, necessary reducing and pressure regulating valves, a heat exchanger, car unloading siding and platform, piping system, calorimixer, electric operated control valve, recording calorimeter and suitable high pressure gas meters.

The butane installation in 1931 was prompted by the fact that Waterbury had a coke oven plant consisting of 27 Gas Machinery Co. inclined gas ovens with a maximum carbonizing capacity of 100 tons of coal per day. These ovens were installed in 1917-18 and had been in continuous operation for 13 years without a major shutdown for repairs. The result was a considerable falling off in gas yield and capacity and increased operating costs. It was to bring back capacities and postpone a major shutdown or abandonment that the above butane plant was installed.

The operation of the plant with the addition of butane was along the following lines: The Btu of the coal gas ranged from 450 to 425 according to the charging periods, quality of coal and many other factors. To maintain a minimum of 530 Btu on the city it was necessary to operate the water gas plant at a high Btu to take care of the dips. After the installation of the butane plant, the Btu of the coal gas plant was purposely reduced to around 450-475 by the introduction of producer gas through the oven walls by maintaining a slightly negative pressure. The butane was vaporized in a heat exchanger, passed under pressure through a control valve operated from a calorimixer, thence through gas meters and was introduced into the gas line at the outlet of the station meters. The calorimixer was under supervisory control of the plant recording calorimeter and thus the butane vapor was introduced in just the required amount to hold a straight line Btu at 530. This method is now known as

**TABLE 1. OPERATING COMPARISONS**

| | 9 Months 1931 (Without Butane) | 9 Months 1932 (With Butane) |
|---|---|---|
| Coal Carbonized Tons | 26,024 | 24,342 |
| Gas Produced Mcf | 292,451 | 333,336 |
| Yield per Lb. Coal cu. ft. | 5.62 | 6.35 |
| Average Btu per cu. ft. | Approx. 500 | 530 |
| Butane used—total gal. | ..... | 290,443 |
| Butane used per Mcf Coal Gas | ..... | .872 |
| Approx. Gravity Mixed Gas | .617 | .676 |

**TABLE 2. ANALYSIS OF BUTANE-STEAM MIXTURE IN COKE OVEN**

| | RAW GAS | BUTANE-STEAM CONTINUOUS FEED | | |
|---|---|---|---|---|
| | At Start | 5 Min. | 30 Min. | 55 Min. |
| $CO_2$ | 5.9 | .8 | 0.0 | 0.2 |
| Ill | 0.0 | 2.2 | 4.2 | 3.3 |
| $O_2$ | 0.1 | 0.5 | 0.3 | 0.5 |
| CO | 15.5 | 3.3 | 0.0 | 1.0 |
| $H_2$ | 11.9 | 52.8 | 43.0 | 42.7 |
| $CH_4$ | 4.8 | 27.4 | 32.3 | 43.5 |
| $N_2$ | 61.8* | 13.0 | 20.2 | 8.8 |
| Butane Pressure | | 5 | 5 | 5 |
| Steam Pressure | | 10 | 10 | 10 |
| Gas Pressure $H_2O$ | | 5 min. | 5 min. | 5 min. |

**The high nitrogen content in raw gas was due to leaks in flues and around door.*

cold enriching as distinguished from cracking in the presence of steam and high temperatures. Some operating comparisons for this 1931-32 period may be interesting and are shown in Table 1.

During the month of September, 1932, the use of butane was stepped up so that the yield per lb. coal carbonized, including butane and producer gas enrichment, reached 7.52 cu. ft. with the use of 1.09 gals. butane per Mcf.

The total cost of the butane plant in 1931 was about $11,000 and the resultant savings in operation at the material prices then effective averaged $1000 per month. This was aside from savings that might arise from the increased capacity obtained. The coal gas plant was operated until 1935 when it was shut down after the installation of a modern nine-ft. mechanical generator water gas set. During the period of 1932-1935, the butane equipment paid for itself several times and no particular operating difficulties were encountered.

### Reforming Butane-Steam Mixtures in Coke Ovens

In April, 1935, before shutting down the coke ovens, an interesting experiment was made in reforming butane and steam through the mass of hot coke in an oven during the last hour before time for pushing. For the purpose of making this test, two oven doors on the discharge side were tapped with two-in. holes about one foot from the bottom. A crude mixing device was made from a two-in., 45° Y. Short one-fourth-in. nipples were inserted through reducers in each leg of the Y. To one of these nipples the butane supply was piped and to the other, high pressure steam. Pressure gauges were inserted in the feed lines as close to the nozzle as convenient. Two valves were used in each line, one to act as a throttle valve and the other as a shut off valve. An attempt was made to meter the butane with a regular oil meter but the readings were not reliable and thus the measuring of steam and butane was more or less guess work.

### What Table 2 Shows

A fair number of experimental runs were made on the two ovens, some using liquid butane for mixing and others using the vapor from the top of a tank car. Many of the tests were erratic but conclusions could be drawn that, with proper control, the butane-steam mixture did reform in the coking chamber and at a rate of from two to seven times the volumes of raw gas coming off the ovens at the time. Some representative analyses of the raw coal gas and the gas from the mixture of butane, steam and coke oven gas are shown in Table 2, after a one-hour run at the end of the coking period on oven No. 24.

Valid conclusions that could be reached are:

1. *There is enough temperature in the coke mass at least partially to reform the liquefied petroleum-steam mixture.*
2. *The resultant gas contains high percentages of $H_2$, $CH_4$ and illuminants.*
3. *The composition of the resultant gas is desirable for mixing and distribution.*
4. *The coke from the ovens under test showed no damage.*
5. *No damage could be observed in the oven walls.*

The mechanical difficulties of introducing steam to the gas through the hot coke in larger ovens are considerable. This is particularly true if contact is going to be made with any great volume of the hot coke. It was our opinion at the time of this test that on large ovens with two take-off or stand pipes, a reasonable amount of the liquefied petroleum-steam mixture could be reformed over the top of the hot coke during the last hour or two of the coking period. This operation could be made fairly simple with a proper mixture of gas and steam supplied through an insulated main and controlled by valves at one standpipe of each oven.

It would seem to the writer that further investigation should be done along this line now that there is the demand for increased peak gas for the house heating loads. This is particularly true in plants not too far from a source of supply of liquefied petroleum or refinery gas so that it could be obtained in quantity and at a nominal cost. The resultant gas would certainly be less costly and better for distribution than the L.P. air mixtures which in order to obtain capacity and save appliance troubles may have to be introduced at from 700 to 900 Btu per cu. ft. No attempt to predict the ultimate increase in capacity that might be had from this operation was made from the Waterbury tests, but with the low gravity-high Btu gas that would be made, thereby allowing further dilution with producer gas, the writer believes that the overall increase might be surprising.

**TABLE 3. RESULTS IN WATER-GAS SET**

| | ONE 8-FT. SET, 1934 | |
|---|---|---|
| | With Butane | Without Butane |
| Water gas made per day | 1,634 Mcf | 1,145 Mcf |
| Gen. fuel per Mcf | 24.70 lbs. | 29.25 lbs. |
| Gas oil per Mcf | 2.45 gal. | 2.76 gal. |
| Butane per Mcf | .714 gal. | ..... |
| Set hours per day | 17.35 | 14.46 |
| Run hours per day | 15.03 | 13.00 |
| Make per set hour | 94.3 Mcf | 79.2 Mcf |
| Make per run hour | 108.9 Mcf | 88.7 Mcf |
| Est. Make per 24 hours | 2,395 Mcf | 1,900 Mcf |
| Average Btu | 530 | 530 |
| Material cost per Mcf | 28.07¢ | 26.93¢ |

**TABLE 4. AVERAGE COMPOSITION OF THE DOWN RUN GAS**

| | BUTANE & STEAM On Down Run | BLUE GAS Without Butane |
|---|---|---|
| $CO_2$ | 3.5% | 5.25% |
| Ill | 1.25 | 0 |
| $O_2$ | 0 | .40 |
| CO | 27.50 | 38.10 |
| $CH_4$ | 9.85 | 2.40 |
| $H_2$ | 52.30 | 50.75 |
| $N_2$ | 5.60 | 3.10 |
| Btu Calc. | 383 | 311 |

### Reforming Butane and Propane In Carburetted Water Gas Sets

In January, 1934, with peak loads running high because of the cold weather, it was decided to try reforming butane in an eight-ft. water gas set to obtain increased capacity. We had two eight-ft. U.G.I. hand clinkered water gas sets equipped with Christman cycle and special nozzles for using a mixture of steam and tar or heavy oil on top of the generator fire. From previous experience with the use of tar or heavy oil, it had been determined that a proper mixture of steam and atomized tar or oil would reform through the generator fire with very little resultant lampblack. Accordingly, a line was run from the butane storage tanks through a standard rotary oil meter and necessary operating valves to the nozzle, which had previously been used with heavy oil. Pressure was raised on the butane tank by the use of steam in coils with which the tanks were equipped.

It was necessary to proceed with caution as we had little idea how the butane would react. Some engineers predicted an excessive formation of lampblack and even naphthalene or pitch, but, of course, results proved that if the fire conditions and steam-butane mixtures were approximately correct, no such formations took place. One of the first points determined was that the down run steam had to be reduced from approximately 135 lbs. per minute to 85 lbs. per minute under the fuel conditions then existing. Recent operation has shown that with good fuel and set conditions, the steam reduction may not be more than 10 or 15%. Early tests also indicated that there was no appreciable increased capacity obtained by introducing butane with the up run steam and working the fire both ways. It was quite apparent that there was only a certain amount of heat that could be obtained from the fire and this could best be used by reforming only on the down run.

Table 3 indicates comparable results with and without the use of butane but with other conditions alike. The high fuel figures in 1934 were due to the use of our own coke which was not corrected for moisture and was of a relatively soft structure. The estimated 24-hour make is based on normal allowance for fire clean. The gas load would not permit full 24 hours' operation as the coal gas plant was carrying the base load at the time.

### Table 4 Reference

Table 4 gives an idea of the average composition of the down run gas during the aforementioned period.

Between 1934 and the present time, butane has been used from time to time for capacity, and during the summer of 1945, it was used more or less continuously as a matter of economy. The price of butane dropped below that of gas oil for a few months. Over this period many tests were made both for capacity and gas composition. In general, the results were similar to those obtained in 1934. It was possible to increase set capacities around 20% with 1 or 2% blow run and the use of .7 to .8 gals. of butane per Mcf. Greater increase up to 30% can be obtained by increasing the blow purge and blow run and cold enriching the make gas with liquid butane or propane.

Following successful experience with butane on the eight-ft. sets, the nine-ft. I.D. mechanical generator sets were also equipped with connections for reforming butane or propane in 1940. These sets are equipped with full back run and for low pressure steam operation. They also have a low pressure steam connection to the top of the generator. The butane nozzle is attached to this generator steam line. Under normal operation, the down run steam is split about 50-50 between the superheater and the generator. We also have extra positions on the automatic controls for these sets which are used for the introduction of butane, propane or heavy oil.

Results of reforming butane on the larger sets were somewhat better than on the eight-ft. sets, principally because of better control of fire conditions. During the fall of 1945 we ran a car of propane to check the reforming with that of butane. Very little difference could be noted in the operation with one car but it is admitted that this was not a very long test.

Table 5 shows results on the nine-

**TABLE 5. RESULTS ON NINE-FT. GENERATORS**

| | Normal Operation | Propane Operation | Butane Operation |
|---|---|---|---|
| Make per set hour | 243 Mcf | 285 Mcf | 286 Mcf |
| Make per run hour | 262 " | 304 " | 306 " |
| Make per run | 13.5 " | 16.1 " | 16.0 " |
| Generator fuel | 25.38 #/M | 25.80 #/M | 22.05 #/M |
| Gas Oil | 3.09 G/M | 2.51 G/M | 2.40 G/M |
| L. P. Gas | | .85 G/M | .93 G/M |

**Analysis of Down-Run Gases**

| | | 9/6/46 | 9/7/45 |
|---|---|---|---|
| $CO_2$ | 5.60% | 3.8% | 2.3% |
| Ill | 0.0 | 1.8 | 1.0 |
| $O_2$ | .60 | .7 | .7 |
| CO | 38.40 | 23.6 | 23.2 |
| $H_2$ | 49.00 | 56.6 | 59.2 |
| $CH_4$ | .10 | 10.6 | 10.0 |
| $C_2H_6$ | .0 | .4 | .8 |
| $N_2$ | 6.30 | 2.5 | 2.8 |
| Btu Calc. | 265 | 420 | 407 |
| Sp. Gr. Calc. | .520 | .460 | .426 |

ft. mechanical generators with and without butane and also with propane.

### Conclusions

Some observations made by the writer over this period of operation and experimentation may be of interest to operators in the industry.

In the first place, liquefied petroleum gas certainly is important as a means of furnishing peak capacity for house-heating loads. It is not, however, the cure-all that many believe. Certainly in the larger plants it may have to be restricted in most locations to the few days of extreme peaks rather than for winter peaks extending over two or three months. In plants adjacent or near a refinery, this may not be true but the fact remains that propane storage is very expensive (around 15 to 20 cents per gal. at the present time) and the oil companies are no more anxious to add this storage than the gas companies. It is also true that the oil companies can use a large amount of their butane output in the winter for adding to the motor gasoline. The tank cars for transportation of propane are expensive to build and the operating cost is high, all of which means that propane or butane is not likely to compete with low cost oils in large gas plants.

In situations where plants are operating with heavy oil, part of which is being reformed through the generator, the use of this gas may be disappointing from a standpoint of capacity. It would be necessary to cut off the reforming of heavy oil and substitute liquefied petroleum gas. There would not be heat enough in the fire to reform both at the same time. It might even be necessary to return temporarily to light oil operation to increase the capacity materially unless it is a matter of cold enriching extra blow run gas, in which case gravity might be the limiting factor.

All of the experience in Waterbury indicates the necessity for a very hot generator fire for the best reforming of the gas, and it is doubtful if operation at increased capacity would be successful with even a small percentage of soft coal added to the generator fuel.

Any gas company contemplating the addition of liquefied petroleum gas for plant capacity should analyze the situation carefully, considering equipment required, guaranteed supply, and cost of the gas at their location. The manufacturer of the sets installed could undoubtedly furnish the necessary information regarding connections and other apparatus required.

To those companies having coke ovens the writer believes there is a possibility for reforming a considerable amount of liquefied petroleum in the ovens over the last hour or two of the charging period. Also, the enriching of producer gas and its mixture with the coke oven gas is a practical operation up to the limitation of the producer plant and the gravity of the output gas. In this connection, it might be noted that the CL&P laboratory has recently made some interesting tests on the mixture of various gases and the resultant effect on burner operation. It was found that mixtures of coke oven gas, producer gas and propane gave excellent operation characteristics on all types of burners. Part of these results have been published and undoubtedly more will appear as the work progresses.

# Laclede Forecasts Swing to Gas in St. Louis if Pipe Line Approved

AT such time as distribution of straight natural gas becomes possible in St. Louis, 90% of all newly built homes will use that fuel for heating as well as for cooking, it was asserted at the opening in June of the Federal Power Commission's hearing on an application of the Mississippi River Fuel Corp. to construct a second pipe line to the area.

The estimate was given by one of the final witnesses of the day, R. J. Vandagriff, sales manager of the Laclede Gas Light Co. of St. Louis, which, with the city, supported the pipe line application. Earlier, the principal witness at the session, Milton M. Kinsey, president of the Board of Public Service, described approval of the application as a matter of vital importance to the city's progress, saying use of natural gas would result in lower rates to consumers and a distinct reduction in the smoke evil.

Proponents of the new pipe line, needed to provide the added capacity required to switch from the present mixture of manufactured and natural gas to straight natural gas, faced strong opposition from coal and railroad interests, whose attorneys interjected frequent objections.

Kinsey answered one objection—that employment would be reduced—by saying that any resulting unemployment, which he thought would be small, would be more than offset by gains to the general public.

"In St. Louis," he said, "because of the higher cost of mixed gas, the consumption per customer is much less than for any natural gas city in Missouri."

Robert W. Otto, vice president and general counsel of Laclede, said the company would have difficulty meeting demands for gas this year, and unless the pipe line could be enlarged, would have to build additional facilities for manufacturing gas.

# No Namesakes, Please

"NEWSWEEK," the national magazine, doesn't want any namesakes. The publishers made that fact plain recently when they ordered "Gas Newsweek," published by the Southern California Gas Co., Los Angeles, for its employees, to "cease and desist" 'from using that title in its masthead.

"We were flattered by such lively attention from our big national namesake," wrote Editor J. T. Van Rensselaer in announcing the order, "and were strongly tempted at first to let the courts decide who is infringing upon what.

"Whether they were perturbed over a possible copyright infringement or merely pained over the public association of the name "Newsweek" with the word "gas" was not exactly clear. After all, we esteem the word "gas" more highly than any other word.

"We doubt if there is any confusion about the identity of the two in the minds of our 4000 or "Newsweek's" 250,000 readers, unless the world has suddenly gone stark nuts."

"Which, of course, it has," amened Matt Weinstock, Los Angeles "Daily News" columnist, in commenting on the issue.

Anyway, Van Rensselaer has returned the name to its rightful owners "unsullied," and henceforth his publication will bear the safer title "SoCal Gas News." Safer, that is, so long as the Los Angeles "Daily News," the San Francisco, Chicago, New York, and sundry other "News's" don't decide to take a corner on the word "news."

And so long as GAS doesn't restrict "gas" to its own private lexicon.

# OXYGEN TEST METER

## For Determining Oxygen or Air Content of Gases Containing Hydrogen

By W. F. GARDNER and R. E. NORRIS

South Metropolitan Gas Co., London

**THE PAPER presented here, by W. F. Gardner and R. E. Norris of the chemical department, South Metropolitan Gas Co., London, England, appeared originally in The Gas World, a British publication, under the title of "Balloon Barrage Purity Meter Described." It describes an oxygen testing instrument developed in Great Britain to meet a wartime need in connection with operation of barrage balloons. In such balloons, the gas gradually becomes contaminated with oxygen from inward diffusion of air through the envelope, and a potentially explosive condition ultimately develops. When pure hydrogen was used it was comparatively simple to test for oxygen with existing thermal conductivity apparatus. However, when it was found necessary to use hydrogen mixed with coal gas in percentages not in excess of 20% of the latter, a new testing method became necessary. It is believed that this method will have interest and peacetime application to the American gas industry—for example, in a gas-making plant, for testing the atmosphere in mains or vessels when purging operations are in progress.**

IN Britain, during World War II, in connection with the operation of barrage balloons filled with high-hydrogen coal gas, a device was needed that would determine the oxygen content of this gas, and to fulfill this need the "Metro" purity meter was designed and supplied.

For oxygen determination a specific reagent was desirable, and it was clear that the hydrogen in the mixture would serve as reagent if selective combustion of the oxygen with the hydrogen could be brought about. The water formed could then be condensed by cooling, and the contraction in volume, or the reduction in pressure at constant volume, measured and the percentage of oxygen deduced. This procedure would avoid the use of liquid reagents which were out of place on balloon sites. Combustion could be very conveniently effected by a platinum filament, heated electrically by current drawn from the accumulator of the engine driving the balloon winch, but it remained to be shown whether by such a method of heating the reaction could be restricted to oxygen and hydrogen.

On combustion of hydrogen and oxygen, the volume contraction is three times the oxygen content (if hydrogen is in excess), but with coal gas present there is the possibility of some of the oxygen uniting with other combustible gases for which the three-to-one ratio does not hold good.

It was shown experimentally that the combustion of constituents other than hydrogen could be avoided by keeping the filament temperature as low as was compatible with reasonable speed of combustion—in any case well below red heat. The temperature of the filament depends on the electrical input, the atmosphere surrounding it ($H_2$ conducts heat much better than most other gases), the surface area of the wire and the shape of the enclosing vessel, and a considerable number of experiments were carried out to determine the most suitable diameter and length of wire to employ.

The shape of the filament vessel was found to influence considerably the time taken to complete a combustion inasmuch as certain shapes promoted convection flow of the gas over the surface of the filament. It was found that a tall narrow vertical cylinder, with the filament mounted axially in the lower half, gave the shortest combustion time.

The salient features of a hot filament purity meter were thus established and after laboratory confirmation in glass vessels the first model Metro purity meter was produced in collaboration with the South Metro-

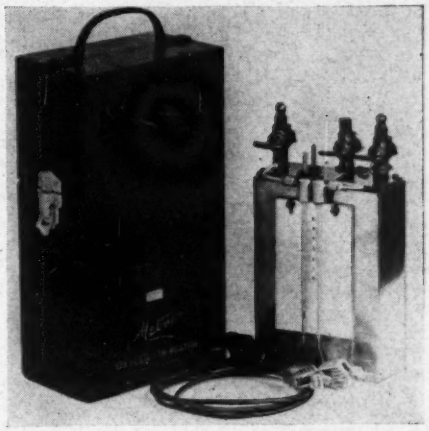


Plate 1. Original model, Oxygen Test Meter.

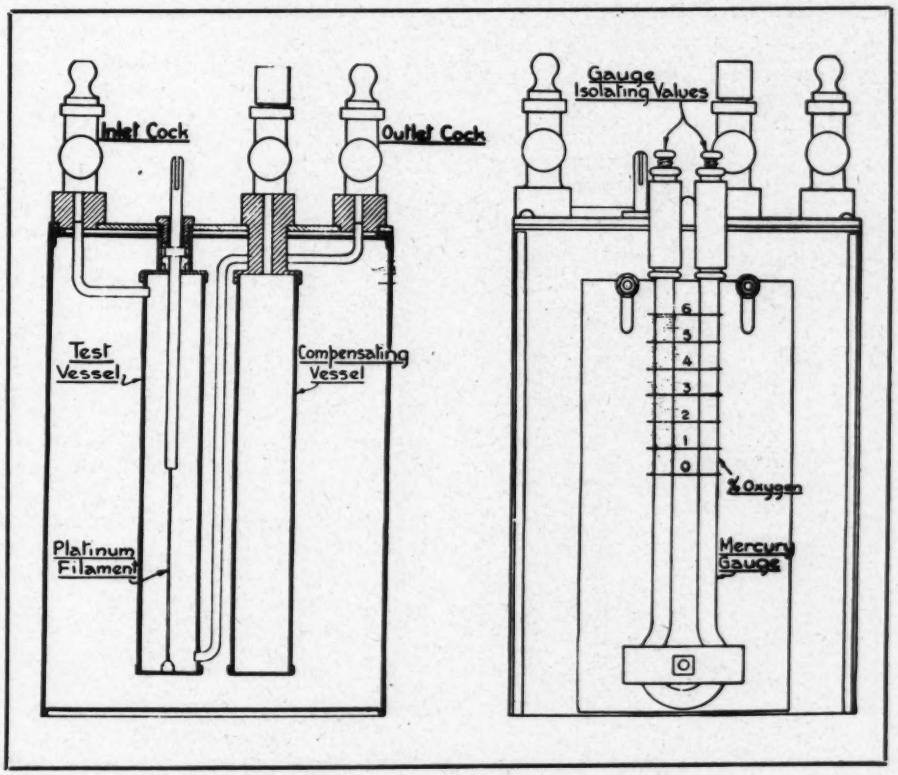



Fig. 1. Detail drawing of the first model of the meter.

## OXYGEN TEST METER

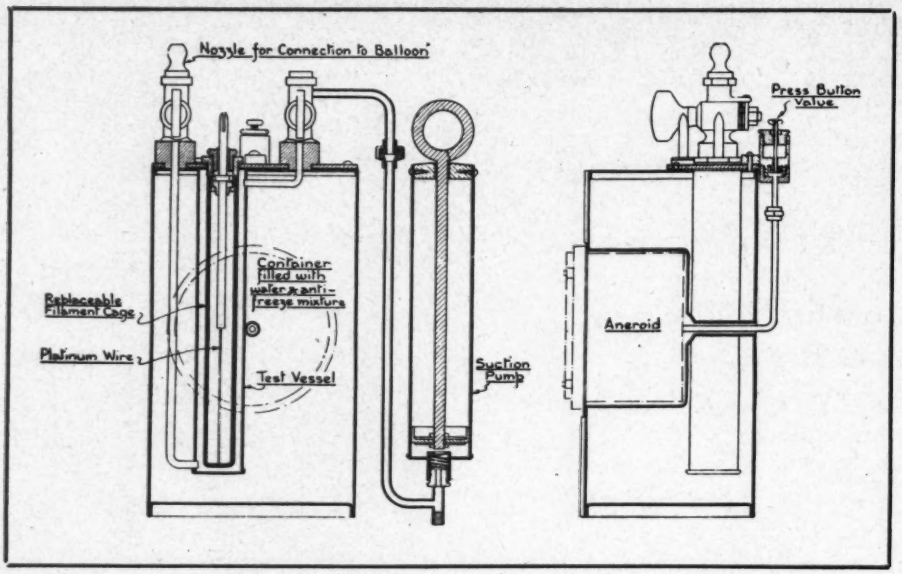



**Fig. 2. Detail drawing of improved model, with aneroid replacing U-gauge.**

politan Gas Co.'s meter-making and meter repairing shops. The meter was robust and constructed entirely of brass except for a capillary glass U-tube serving as a mercury differential pressure gauge.

The meter consisted of a pair of similar cylindrical chambers mounted vertically and close together in a water jacket (the water containing an anti-freeze preparation). The test vessel, with the filament mounted in its lower portion, was provided with top inlet and bottom outlet cocks to enable a gas sample to be aspirated through it; the other vessel had a single cock to open it to the air as required. The latter vessel acted as a compensator to eliminate errors due to the small changes in temperatures which are inherent in the method of test. Each vessel was connected by capillary brass tube to one limb of the differential mercury U-gauge, so that, should the water bath change in temperature, the gaseous contents of both tubes would be similarly affected and the gauge would remain undisturbed.

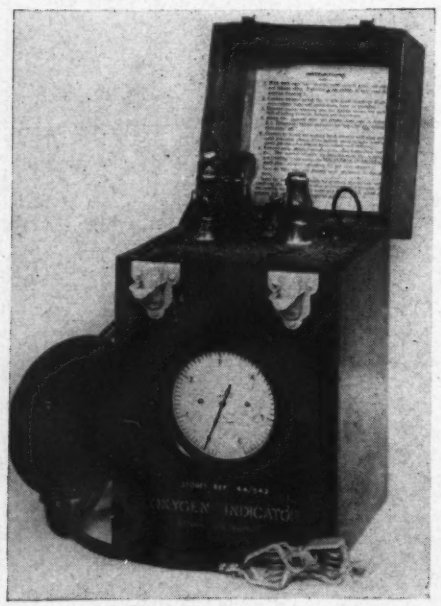


**Plate 2. Improved test meter, with aneroid indicator.**

Having drawn a gas sample into the meter the pressure in both vessels was adjusted to atmospheric and all cocks were closed. The filament was heated by a six-volt car battery for a few minutes whereby the oxygen in the test vessel was consumed. On disconnecting the battery and cooling, a pressure reduction was evident in the test vessel and the mercury level in the appropriate gauge limb ascended and registered the change of pressure. The U-gauge scale was graduated to read percentages of oxygen direct.

The instrument was supplied in a wooden case, provided with a vertical glass window for reading the U-gauge, and the case also contained India rubber suction bellows to draw gas samples from the balloon into the test vessel, and a cable to connect the instrument to the car battery. The first of these instruments was officially certified and used as a master standard against which all subsequent instruments were checked, and it made subsequently thousands of tests and still gave perfectly accurate results.

This model is shown in Plate 1, and in Fig. 1, if the gauge isolating valves shown therein are omitted.

This first type of instrument showed one serious defect in service inasmuch as the mercury was likely to be lost from the gauge into the gas vessels should the meter be overturned. This was obviated in a second model by providing a small spring-loaded, rubber-faced mushroom valve in each brass gauge cap to isolate the gauge from the rest of the instrument. The valves were opened by finger pressure when a reading was to be taken. Despite this improvement, the mercury was still a source of trouble, occasionally becoming sluggish despite the presence in the tube of a surface tension-reducing lubricant.

Eventually it was decided to replace the U-gauge by an aneroid indicator. As differential aneroids were not available the purity meter was modified so that a three-in. diameter, flush-mounting, aircraft-type instrument could be utilized.

The aneroid was isolated from the combustion vessel by a single press-button valve, connection being made only when taking a reading, and the scale was graduated to read percentages of oxygen. This model is shown in Plate 2 and Fig. 2.

The purity meter was designed and made to satisfy a very unusual need arising out of defense operations and nearly 7000 of these instruments were supplied to the authorities.

## Texas College Schedules Gas Technology Course

Dr. Frank H. Dotterweich, head of the Texas College of Arts and Industries engineering department, has been selected as chairman of the administrative committee for the gas technology course to be held on the A&I campus in Kingsville, Texas, Aug. 27-29. The course is being sponsored by the Southern Gas Association, and Robert R. Suttle, SGA managing director, has helped to outline the course and is coordinating the plans of the college and industry.

Other members of the committee include Dr. W. G. Hugly, director of research for the Southwestern Settlement and Development Corp., who is arranging the program on dehydration of foods and wood, assisted by Robert Hutchison, research director of the Houston Natural Gas Corp.; Larry L. Ladewig, director of gas utilization at Houston Natural, who is in charge of air conditioning; and Elton Sterrett, executive secretary of the National Association of Corrosion Engineers, who is scheduling speakers on the transmission phases of the course.

Noel C. McGuire and Durward Emery, A&I instructors, will demonstrate subsurface gas flow and high pressure gas condensate reservoir engineering through the use of an electrolytic model table. The new Turner Burrell solid absorption fractionation apparatus will be demonstrated.

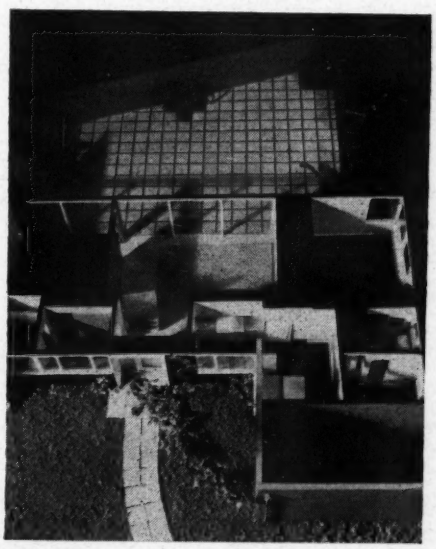
# First Case Study House Completed

The living room and the two bedrooms open directly on a paved terrace which, surrounded by a high wall, adds to the space within the house, proving that large size is not a requirement for expansive living. Outside terrace and inside floor level are the same.

"ALL GAS" is an important footnote to Case Study House No. 11, first of 15 demonstration houses to be built in Los Angeles by the magazine *Arts & Architecture*. The house was opened to the public for eight weeks' demonstration July 21.

A 1250-sq.-ft. house, equipped with what its builders term the finest products that could be found for gracious living, it represents the initial step in a project aimed to integrate ideas and talk of postwar building into actual houses. The 15 homes, some on the drawing boards a year ago (GAS—July, '45), are designed as solutions to 15 specific problems. No. 11 is intended for a small family consisting of a couple with a teen-age child. Others are built for various types of family groups.

Cooking, refrigeration, water heating, and space heating will all be gas-fired in CSHouse No. 11, as well as the next six Case Study Houses to be built. Every article in the house will be available on the market. Thus the house has been planned as a practical demonstration of the comfortable living possible with existing standard products.



Floor plan in Case Study House No 11, showing coordination of indoor and outdoor living areas.

The radiant heating system is likely to provoke more comment than any other single feature. The system in CSH No. 11 is made up of 1100 ft. of ¾-in. copper tubing looped back and forth under the whole floor of the house. The floor and heating tubes were built up as follows: first a 2½-in. base of crushed rock was laid and tamped down, a 1-in. concrete membrane was poured over it, heavy waterproof Angier paper was laid on the concrete, copper tubing put in place on the paper and the final layer of 2½-in. concrete was poured over the tubing.

Water warmed to about 115 degrees will circulate through the tubing. Temperature of the floor is expected to run between 75 and 85 degrees when the system is in use. Objects in the room are warmed by radiation while the air remains cool. The designers believe that practically no layer of hot air will exist at the ceiling. Although the living room floor will be covered with asphalt tile and both bedrooms will be carpeted, the system will be fully effective, it is predicted.

The water is warmed by a Crane boiler, which is controlled by a thermostat to keep the house at an even temperature. However, five valves make it possible to shut off one or more rooms from the system if it is desired, for instance, to have bedrooms cool while the rest of the house is warm.

Other gas appliances are a Western Holly stove, eight-cu.-ft. Servel gas refrigerator, and a SMITHway Permaglas water heater. The water heater is 60-gal. size, twice that of the ordinary small house.

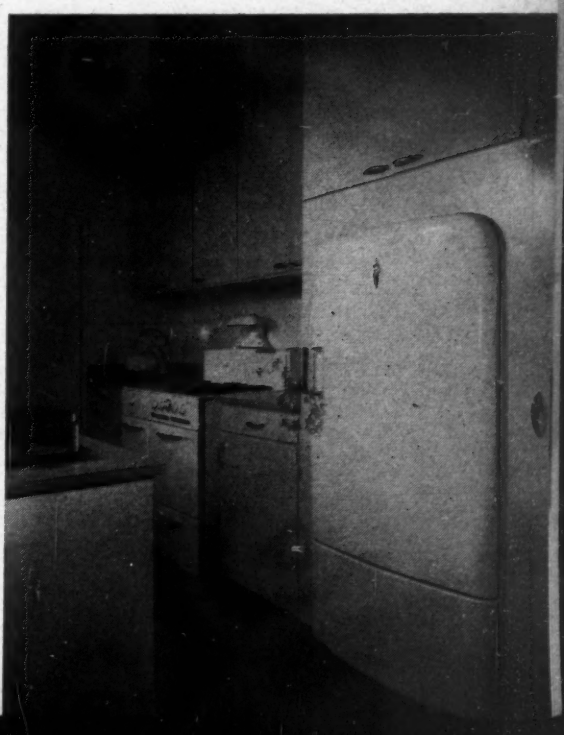
Case Study House No. 11 includes living room, two bedrooms, dressing room, kitchen and eating nook, utility space, and a bath and a half. It was designed by J. R. Davidson of Los Angeles.

Living room and both bedrooms open onto an irregularly shaped paved terrace roughly 48 x 20 ft. Master bedroom and living room have what is virtually a 33-ft. wall of glass facing the terrace to the south. Eight-foot-high panels of quarter-inch plate glass extend along 13½ ft. of the back wall of the bedroom and along 20 ft. of the living room.

Each of the two rooms has a sliding panel opening onto the terrace. Inside floor level is the same as the terrace surface. The nearly flat roof overhangs

Two other Case Study Houses, both "all gas," will be completed and demonstrated this year. The others are to be shown early next year, according to present building schedule.

View of kitchen showing Western-Holly range and Servel refrigerator. Floor covering is asphalt tile.



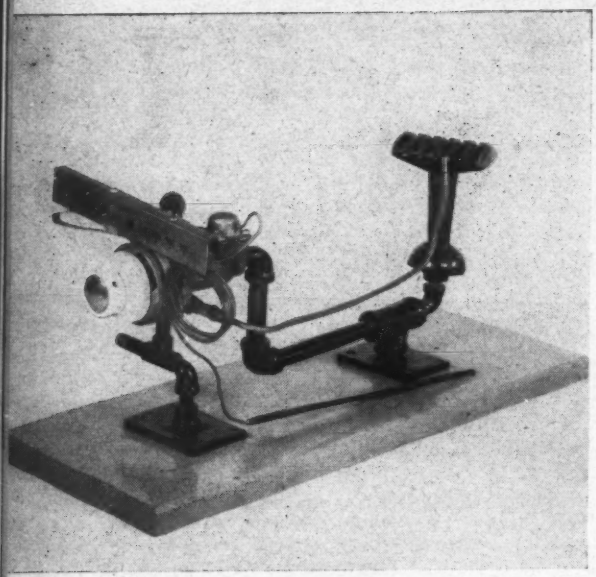


Fig. 2. Oven Thermostat assembly.

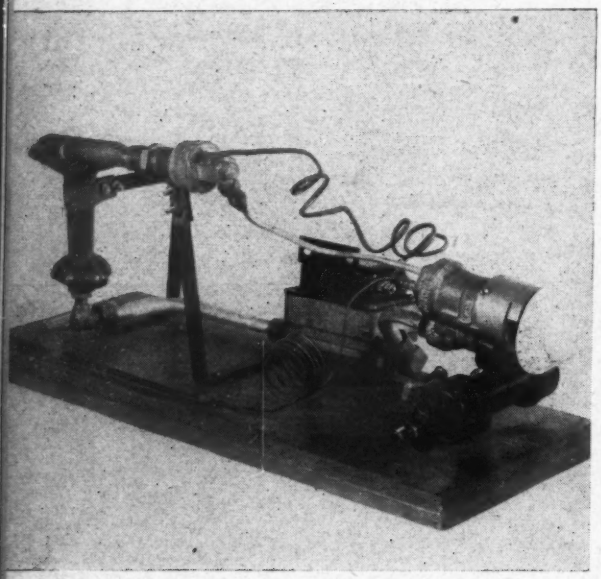


Fig. 3. General B-60 control, as applied to ovens.

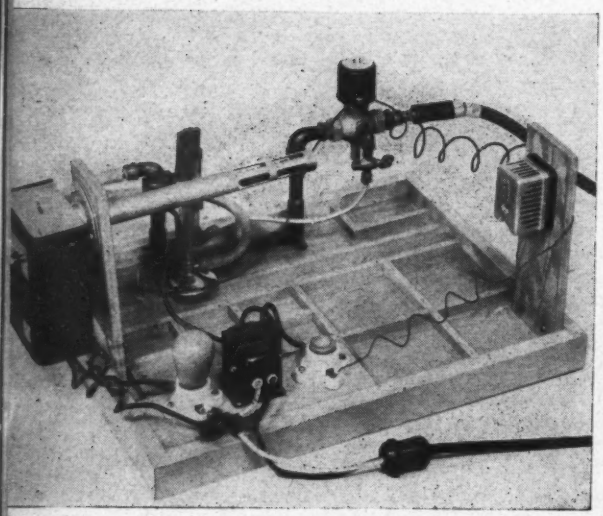


Fig. 4. Forced air furnace control.

# New Trends ov

# TRAINING CM

By C. C. WESTMORE[illegible]rn C

THE fundamental concept of training which governs the activities of the Customer Service Training group of the Southern California Gas Co. is identical with that of other companies who have formalized a course of training to familiarize employees with the numerous job duties of the appliance mechanic. The general procedure of combining field and classroom instruction, usually followed by the industry, is the basic pattern followed by our group, the only difference being the distribution of time between classroom and field instruction.

Originally, field training occupied the predominant role and constituted over 90% of the training time. That figure has been revised through successive steps which decreased the percentage of time devoted to field training and increased the classroom training period. At the present time field training constitutes approximately 13% of the training period and classroom training makes up the remaining 87%. It is felt that the above revision is the principal factor which has made it possible to reduce the over-all training time approximately 60%. The determining factor deciding the amount of training that can be effectively done in classrooms is the equipment available for use by the training group.

Presented at the Pacific Coast Gas Association Utilization Conference, Technical Section, Sacramento, Calif., April 24-25.

### Facilities and Equipment

The amount of equipment required to administer a training course will vary widely with different companies. Company organization, service policy, labor turnover, and geographic distribution of properties are some of the major variables influencing the organization of a training course, which in turn will determine the selection of facilities and equipment. The problems of each company are different and no ready-made training program will fit all situations.

The principal advantage gained

| | SQ. FT. | NO. OF APPLIANCES | NO. OF MANIPULATION BOARDS | NO. OF CUTAWAY CONTROLS |
|---|---|---|---|---|
| RANGE ROOM | 621 | 10 | 14 | 89 |
| WATER HEATER ROOM | 580 | 14 | 28 | 85 |
| REFRIGERATION ROOM | 870 | 10 | 5 | 21 |
| AUDITORIUM | 1020 | -- | -- | -- |
| FORMS & PROCEDURE ROOM | 850 | 6 | -- | -- |
| HEATING ROOM | 915 | 52 | 34 | 37 |
| SHOP | 356 | -- | -- | -- |
| METER & REGULATOR ROOM | 792 | 10* | -- | 22** |
| OFFICE | 1480 | -- | -- | -- |
| | 7484 | 102 | 81 | 254 |

* OPERATIVE METER SETS
** CUTAWAY METERS AND REGULATORS

Fig. 1. Training facilities and equipment.

# evelopments in

# MPLOYEES

rn California Gas Co., Los Angeles

from the extensive use of training equipment lies in the fact that a greater part of the course can be conducted in the classroom, which provides for closer control of training routines. Such control makes it possible to assure adequate coverage of subjects in a uniform manner planned for ease of learning, which in turn reduces the training period.

Comparatively little equipment need not be regarded as an insurmountable limitation in conducting a training course. It will probably mean, however, that considerably more time will be required to obtain acceptable results. The physical plant occupied by the Customer Service Training department of the Southern California Gas Co. occupies 7500 sq. ft. Housed in this area are 86 representative appliances, 56 operative manipulation boards, and 232 cutaway controls. Specific information regarding the space and equipment related to various activities is tabulated in Fig. 1. With few exceptions the names of the above facilities indicate their use in the training course. The Forms and Procedure room is an area partitioned into two sections containing a model kitchen, a range, an automatic water heater, an Electrolux, and two space heaters connected to one meter.

### Specially Equipped Classrooms

Students receive training related to the various appliances in classrooms equipped to cover a specific subject. Near the end of the course the Forms and Procedure room is used for training intended to consolidate the points treated earlier into procedures involving meters, appliances, and clerical forms, which will result in the completion of the various types of work assignments. Sample orders, such as turn-ons, closes, periodic meter changes, and high bill investigations, are practiced for several days in an effort to develop fundamental routines which will be helpful in executing assignments in the field. The shop equipped with a few power tools and numerous hand tools is used to fabricate the training "props" used in the courses.

The selection of appliances in most cases was based on the frequency with which they are encountered by servicemen in the field. "Problem" appliances of questionable design requiring extremely precise adjustments are useful for advanced instruction but should not be used extensively in training new people. That point was clearly demonstrated in our early experiences with classroom training. At one time all the portable space heaters in the heating room were old, poorly designed trouble makers which had been used in refresher courses for experienced servicemen. When new people who had received that type of training were released to the field, they were inclined to be too critical of space heaters in general and reluctant to attempt adjustments. A few modern pieces of equipment and a different approach by instructors has overcome that attitude to a considerable degree.

### Manipulation Board

The term "manipulation board" was coined to identify equipment mounted in a manner which makes it possible for the controls to be adjusted and operated as though they were part of an appliance. A few examples of manipulation boards are shown in Figs. 2, 3, 4, 5, 6, and 7. This type of training aid was found to be exceptionally useful in a variety of ways. In many cases a manipulation board can be used as an inexpensive substitute for a complete appliance. Rapid understanding of the entire mechanism is possible because the relationship of the various parts is clearly evident. The students can apparently carry over the knowledge gained on manipulation boards to complete appliances with little difficulty. Since the boards are portable it is possible to set up a classroom in almost any lo-

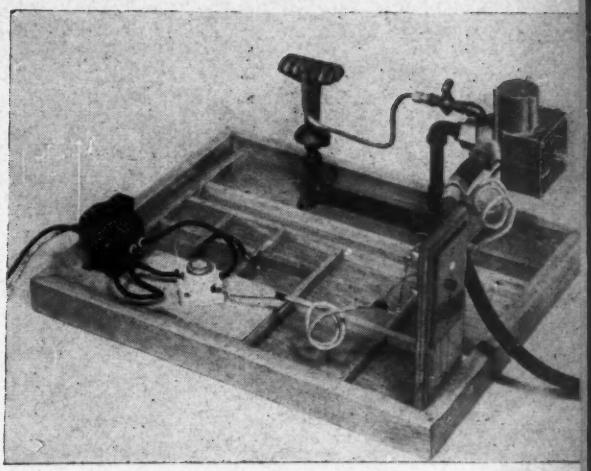


Fig. 5. Three-way control valve commonly used in gravity furnaces.

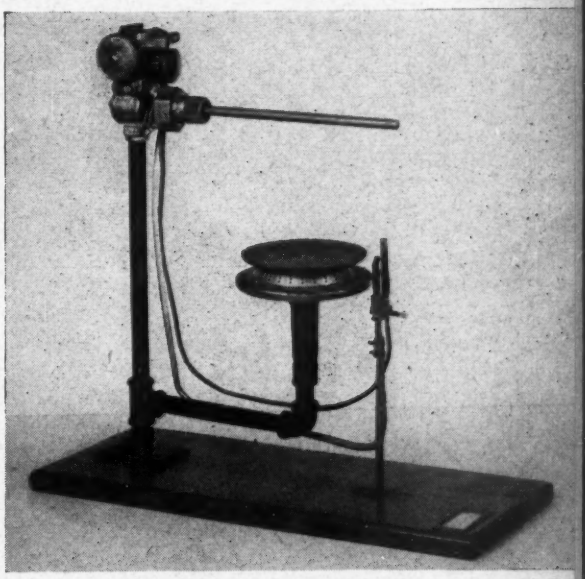


Fig. 6. Water heater thermostat and automatic pilot assembly.

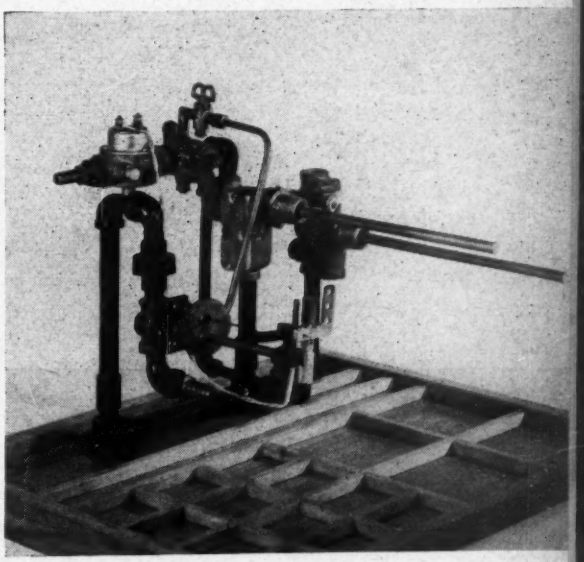


Fig. 7. Same type instrument as Fig. 6, different model.

cation. The value of cutaway exhibits as a means of covering construction details of controls has long been recognized and does not warrant extensive discussion at this time.

Less known but rapidly gaining popularity in our industry are the exploded type of drawings which are used in a manner comparable to cutaway controls. Fig. 8 is an example of the exploded type drawing. The value of this type of drawing in industry was conclusively proved during the war. It was found that marginal laborers were able to understand quickly and perform complex assembly operations with a minimum breaking-in period when exploded drawings were used for instruction purposes. This technique is being treated in conjunction with cutaway exhibits because they both are used to explain obscure construction details of appliance accessories. The drawing is comparable to cutaway controls in effectiveness for most purposes and has distinct advantages for some types of application. When there is a need for wide-spread distribution of information relating to a specific control which will be used for reference purposes in the field, the exploded drawing together with the printed instructions is usually the cheapest, quickest, and most effective method to use. Cross-section drawings are another means of accomplishing this purpose, but in my opinion they run a poor second and will eventually be considered obsolete as an instruction technique.

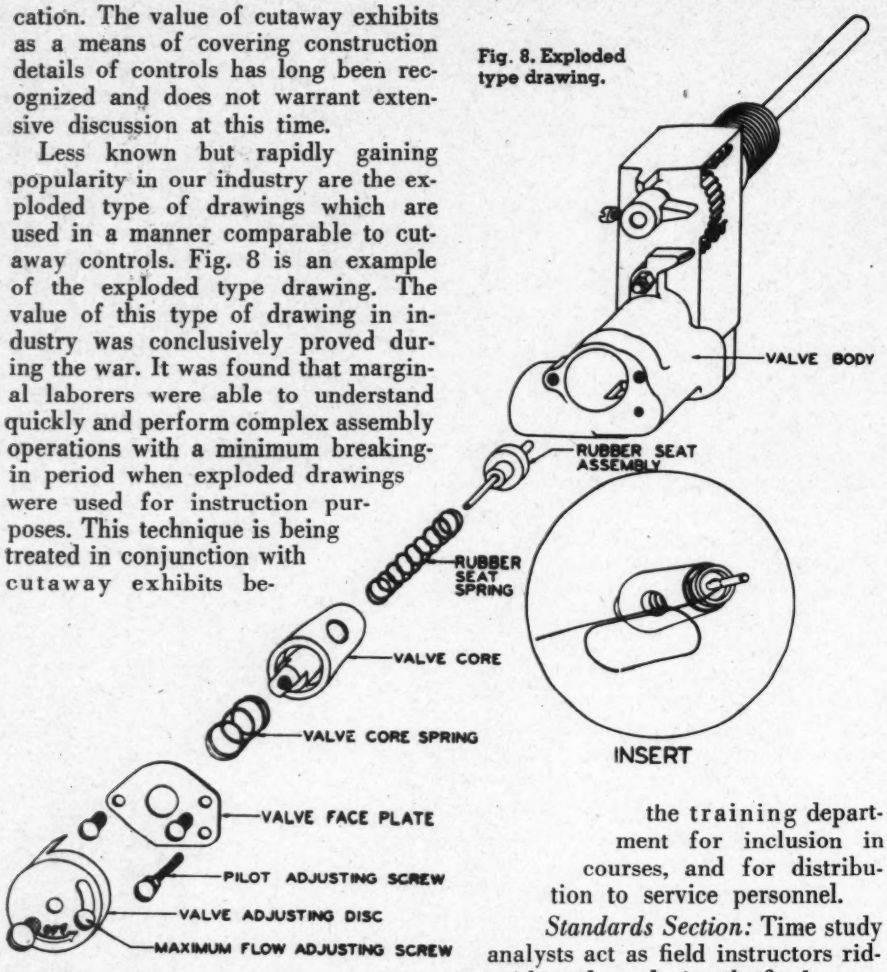



Fig. 8. Exploded type drawing.

### Personnel

Fig. 9 shows the sections and individuals of the Customer Service department involved in training activities. The upper part of the chart represents groups directly responsible to the manager of customer service for specific functions. In addition, they contribute to the training program in the following manner:

*Ordinance Section:* Supplies information about municipal ordinances to the training department for inclusion in courses, and for distribution to service personnel.

*Standards Section:* Time study analysts act as field instructors riding with students during the final stages of training. Specific methods for performing certain operations based on extensive time studies are obtained from the standards section for inclusion in training courses. Time studies conducted by this group are used as a basis for determining the amount of work that should be completed by newly trained employees.

*Quality Control:* Service inspectors act as field instructors by riding with students during the final stages of training. This group conducts field inspections of recently-trained employees' work and compiles monthly reports indicating the individual's progress on the job. Those reports are used in the training department for course revisions and for appraising the overall effectiveness of the training program. Line supervisors use the reports to advise new employees of their status.

*Utilization Engineer:* Training problems involving engineering or design of equipment are referred to the utilization engineer's office. Advanced information on new appliances is secured through a representative of the utilization engineer's office and used for preparing mechanical bulletins for service personnel.

*Operating Superintendents:* Line supervisors reporting through operating superintendents conduct the final phase of field training. The observations of those men together with the training record of the students are the deciding factor determining whether or not the trainee meets the requirements of the job. Individual follow-up training is conducted by supervisors until the new student is considered fully competent to perform the work.

*Dispatch Office:* Dispatch offices throughout the system dispatch selected routes of work to the newly trained employee. Those routes are combined to include representative work which can be sampled by service inspectors of the Quality Control department.

### Lower Half of Chart

The lower half of the chart represents the individuals assigned specifically to Customer Service Training department activities. The dealer service representative devotes his time exclusively to promoting better appliance installations. Servicemen encountering poor appliance installations in customers' homes forward resentative who contacts the appliance the facts to the dealer service representative. Those calls are made with the intent of helping the dealer with his installation problems. In most cases, lack of knowledge was found to be the reason for poor work. Dealers, as a group, are interested in maximum customer satisfaction and willingly cooperate in having their installers receive training.

Courses of instruction directed at specific problems are organized and conducted by the dealer service representative. When large groups attend those meetings, one or more instructors lends assistance. During 1945, 88 meetings were held with a total of 7519 man-hours of attendance by groups such as plumbers, appliance installers, federal housing project maintenance men, and Los Angeles Board of Education maintenance men.

It is the instructors who conduct the basic courses that are currently being held in constant session. The organization of the Southern California Gas Co. Customer Service Training department would normally require that only two basic courses be conducted. The service personnel is divided into two groups. "Serviceman No. 2" is the lower classification with job duties involving less responsibility and experience than the higher "Serviceman No. 1" classification. Separate courses are conducted to supply replacements for the Servicemen No. 2 group and to up-grade Servicemen

No 2 into the Serviceman No. 1 classification. Despite the tight labor market in 1945, 16,560 student hours of classroom training were devoted to those two activities.

During 1945, servicemen who had served in the armed forces began to return in relatively large numbers. A special ten-day course was inaugurated to re-establish those men in their old jobs. That course has been in session continuously since Nov. 13, 1945. Two thousand four hundred forty student hours of classroom instruction were devoted to that activity during the latter part of 1945.

### Shortage of Servicemen

The severe shortage of servicemen during last year restricted the number of meetings held for experienced men. Only one series of 31 meetings, involving 1730 man-hours, could be justified. Those sessions were devoted to range servicing. Several points were covered but range calibration was the principle subject. The meetings were held, despite manpower shortages, to publicize improved methods which materially reduced the amount of time required to complete certain operations.

Over 1790 student hours spread over 50 meetings were spent in an 18-hour course for clerical employees. The course was conducted primarily for Dispatch Office personnel who contact the public by telephone. It was found that those people were better able to handle customers' calls after they had received instruction on appliance operation and adjustments.

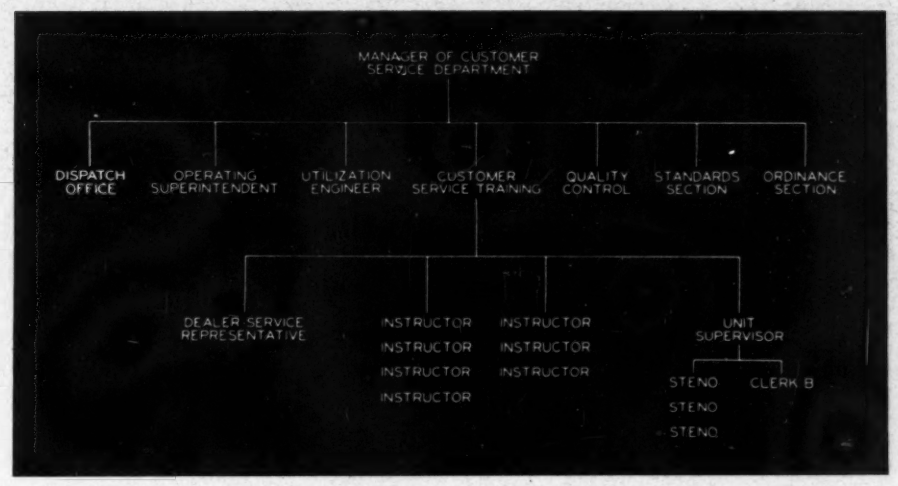



Fig. 9. Organization Chart.

In addition to conducting classes, instructors submit weekly reports of students' progress, prepare training course material, build training props, and write bulletins relating to mechanical problems. The year 1945 did not usher in many new appliances or accessories. Only 17 bulletins were issued to guide servicemen in performing mechanical adjustments on appliances. The new equipment just now reaching the market is accelerating the mechanical bulletin activity. As additional models of complicated design are produced, the routine of keeping servicemen informed of new developments will become more important.

The Serviceman No. 1 and Serviceman No. 2 courses are organized along similar lines in that they are divided into subjects dealing with various appliances, followed by practice orders in the controlled conditions of the classroom, and concluded with instruction given in the field. The process of training an inexperienced man to the level of a Serviceman No. 2 is more difficult than upgrading a Serviceman No. 2 to the Serviceman No. 1 classification. Fig. 10 illustrates the organization of the Serviceman No. 2 course.

The 29 squares on the horizontal plane indicate the 29 days necessary to administer the complete Serviceman No. 2 course. Each square on the chart represents one instructor day devoted to training a group of 16 students. During the first 21 days of instruction relating to the subjects indicated, it is possible for one instructor to control and direct the group's activities. During the last three days of classroom training, when test orders are administered, it is necessary to assign two instructors to the project.

At the conclusion of the classroom training period the students go into the field accompanied by a person qualified to give further instruction and observe their field practices. Supervisors, service inspectors and time study analysts assist in this phase of the work. During the field training period, approximately half of a normal day's work assignment is completed by students on each of the five days. In summarizing the man days of instructor time necessary to train a class of 16 Servicemen No. 2, the following points are pertinent: 80 man days are necessary for five days of field training; 27 man days are required to conduct 24 days of classroom training. Forty man days of

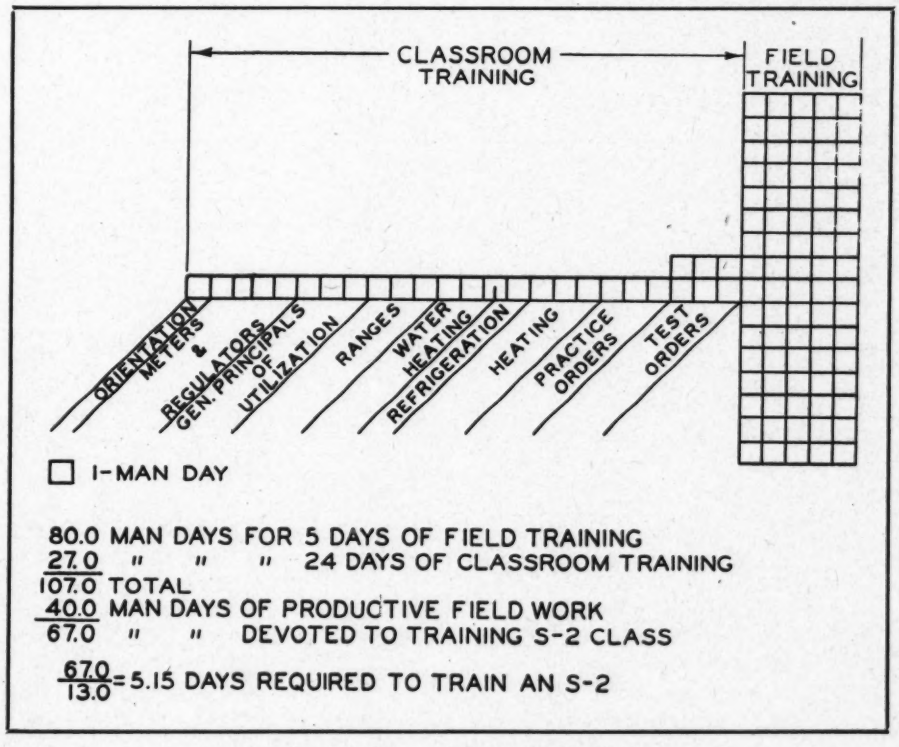

CLASSROOM TRAINING
FIELD TRAINING
ORIENTATION METERS
REGULATORS GEN. PRINCIPALS OF UTILIZATION
RANGES
WATER HEATING REFRIGERATION
HEATING
PRACTICE ORDERS
TEST ORDERS
1-MAN DAY
80.0 MAN DAYS FOR 5 DAYS OF FIELD TRAINING
27.0 " " " 24 DAYS OF CLASSROOM TRAINING
107.0 TOTAL
40.0 MAN DAYS OF PRODUCTIVE FIELD WORK
67.0 " " DEVOTED TO TRAINING S-2 CLASS
67.0 / 13.0 = 5.15 DAYS REQUIRED TO TRAIN AN S-2

Fig. 10. Organization of Serviceman No. 2 Course.

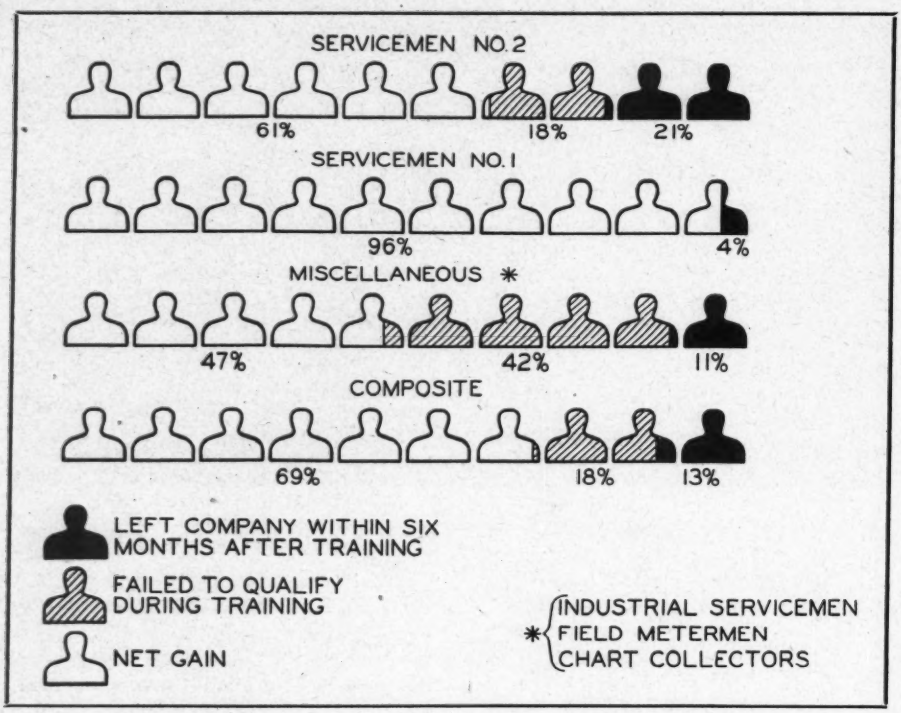



**Fig. 11. Results of training for Servicemen No. 2.**

field work completed during the field training period should be subtracted, leaving 67 days devoted to training the group.

Data which will be explained in conjunction with Fig. 11 shows that 13 students out of a class of 16 applicants will meet the established requirements and be assigned the Serviceman No. 2 classification. When the 67 instructor man days are divided equally between 13 students, 5.15 man days are required to train an inexperienced man to perform the duties of a Serviceman No. 2.

### Three Instructor Man Days

A chart of the Serviceman No. 1 course would closely resemble Fig. 10. The 24 days of classroom work are distributed differently between subjects and only two days of field instruction are scheduled as a part of training. The shortened field training period reduces the amount of time to train a Serviceman No. 1 to approximately three instructor man days.

It should be remembered, however, that the above figures are based on the assumption that classes can be filled to capacity each time they are scheduled. Such an arrangement is not always possible. Operating needs and limited numbers of recruits often make it necessary to conduct classes for smaller groups with a corresponding increase in the instructor hours devoted to individual students.

### Manpower Gains

A graphic representation of the manpower gains (expressed in percentages) obtained through training is shown in Fig. 11. The chart is broken down into sections analyzing the major training activities conducted during 1945.

In the Serviceman No. 2 group, 18% of the applicants were disqualified during the training period; 21% left the employ of the company within six months after being trained, leaving 61% of the persons trained as the net gain. A part of the 21% who left the company after completing their training period were asked to leave because of poor performance records, but a substantial number left on their own initiative to accept work more to their liking.

The data illustrated in the Serviceman No. 1 section of the chart is based on a rather small sample and may not be completely valid. One conclusion, however, may be drawn; it appears that the screening done in the Serviceman No. 2 course was quite effective because those men who successfully complete the Serviceman No. 2 course have little difficulty in qualifying for the Serviceman No. 1 assignment. That point is based on the fact that no failures occurred during training and only 4% of the group left the company within six months after they completed the course.

Again, in the miscellaneous group a small sample was involved. The relatively high percentage of failures during training can be attributed to several factors: In one case we were obliged to attempt to train several individuals for jobs obviously beyond their capacity. In the case of another classification, the dearth of specialized talent available on the labor market resulted in a high percentage of failures.

### Post-Training Progress

The performance of recently trained servicemen is closely followed by the Quality Control section of the Customer Service department. Frequent samples of the new man's work in customers' homes is inspected and monthly reports on the progress of each individual are prepared. The nature and frequency of the errors guide the foreman in the follow-up training he gives the man by riding with him in the field. Data taken from

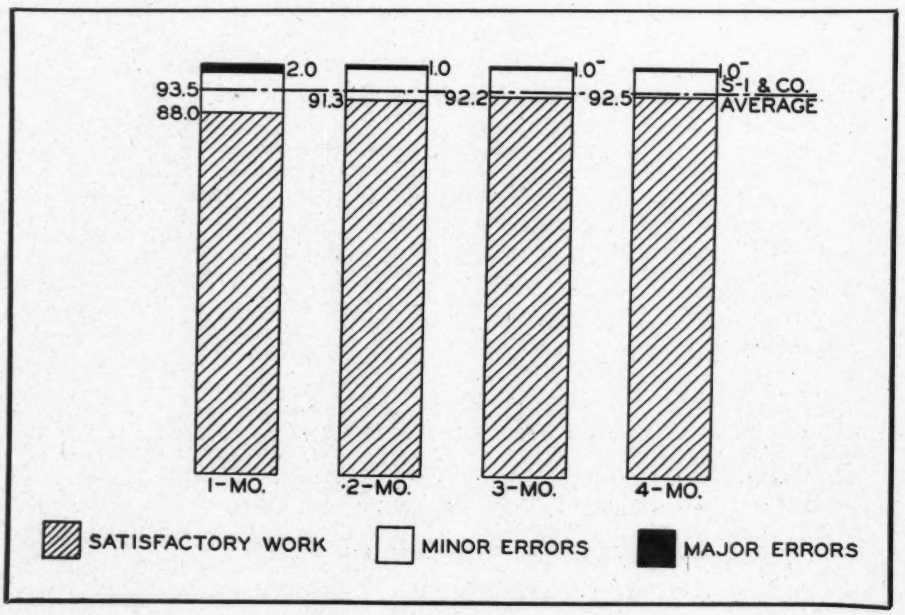



**Fig. 12. Progress of new Servicemen No. 2.**

Quality Control studies was used to prepare Fig. 12 showing the progress of new Servicemen No. 2. The shaded section represents the percentage of work performed in a satisfactory manner. The white area denotes minor errors, while the black section indicates major errors. The base line used on that chart as an indication of normal performance is not completely valid when used in this manner because it was established by the Serviceman No. 1 group whose job duties are more exacting than the job duties of the Serviceman No. 2. Regardless of the questionable validity of the base line, the learning curve of new Servicemen No. 2 indicates that within four months the field error frequency should closely approximate that of the Serviceman No. 1 group averaging about 12 years seniority. Much credit is due the supervisors for the work they have done with the men assigned to them. It has been observed that the rate of a new man's progress is usually directly proportional to the amount of attention he receives from his supervisor. It is evident therefore, that the post-training success of students should be attributed largely to the foremen.

The objectives we hope to achieve in the basic courses of training are twofold. First we are under the necessity of releasing a mechanic capable of meeting the customer's immediate needs. This is a must as an end product of training. In addition, we feel responsible for giving the new employee a sound foundation of fundamental knowledge which will assure continued development of the individual on the job.

## Dayton P & L Employee Contest

PRIZES ranging from $1 to a 17-jewel Gruen watch were offered to winners of an employees' contest launched recently by the Dayton Power and Light Co., Dayton, Ohio. The first contest of its kind sponsored by the company, it offered 24 prizes for accounts of humorous, tragic, impressive or frightening experiences, or of the rendering of unusual services to the company.

Awards which Glee Hancock, of the Girls' Service Club; Ivan Eppley, president, Key Men's Club (seated); Clyde Bielstein, personnel department, and James Sweeney, editor of the house organ "Forward," are shown displaying, include the two watches—men's and women's types, the man's traveling bag and ladies' overnight case, alternate prizes for second place; pocket size radio, third prize; all-wool blanket, fourth prize; cast aluminum pressure cooker, fifth prize; and manicure sets, pen and pencil set, cutlery set, and hygrometer-thermometer, sixth to ninth prizes.

Fifteen $1 awards are being given as consolation.

**M. L. Arnold, retiring president of the California Natural Gasoline Association, at left, hands the gavel to M. W. Kibre, incoming president, at the annual meeting of the board of directors, at the Biltmore Hotel July 9. Kibre is connected with General Petroleum Corp. in Los Angeles.**

## B. C. Electric Plans High Pressure Main

Construction has commenced on a new high pressure gas system for the B. C. Electric Railway Co. The new main will be 9300 ft. in length and 17 in. in diameter. Installation will be completed by fall at a cost of $125,000.

The main will enable a high pressure system of the company to be extended through several areas of Vancouver and will equalize pressure to stores and dwellings. Regulators will be installed at strategic points to step down pressure to the lower level necessary for branch mains and dwellings. The general contract for the project has been placed with Bennett & White Construction Co. Ltd., Vancouver.

In Victoria, B. C., tenders have been invited by the Victoria Gas Co., a subsidiary of B. C. Electric. The company is planning to lay 8635 ft. of steel gas pipe in Victoria as part of an expansion project.

# TECHNICAL TRENDS

By GUY CORFIELD, Technical Editor

## Will War-Plant Ammonia Survive?

There has been considerable speculation as to whether the chemical industries, which played such a conspicuous part in the recent global conflict, will survive the natural and normal economics and competition of peace-time industry and commerce. In this connection it is interesting to note the reports in contemporary journals ("Petroleum Refiner," June, 1946, p. 97, and "Oil and Gas Journal," June 22, 1946, p. 99) that the Lion Oil Co. is planning to operate a former War Department synthetic ammonium nitrate plant, using natural gas as the principal raw material, for the production of anhydrous ammonia, fertilizers, and other synthetic chemicals.

This plant, at El Dorado, Ark., formerly the Ozark Ordnance Works, came under private operation on May 13, 1946, on long term lease to the Lion Oil Co., Chemical Division. The raw ingredients are natural gas, air and water, the natural gas not only providing hydrogen but being the prime source of fuel and power. The plant produces from 450 to 500 tons of ammonia per day, 22 Mcf of natural gas per ton being actually processed (not including fuel and power requirements).

Very briefly, the process consists of desulfurizing of the gas, primary reforming in the presence of superheated steam, addition of air, secondary reforming, removal of carbonic oxides (producing hydrogen and nitrogen in theoretical ammonia proportions), final compressing to 5000 psig, and catalytic synthesis to ammonia. As further steps, nitric acid may be made by burning with air in the presence of a catalyst to form oxides of nitrogen, followed by combination with water; and ammonium nitrate can be produced by combination of ammonia with nitric acid.

The gas industry will watch this venture with interest not only because it is a full-scale example of the use of natural gas as a chemical raw material, but also because it will be interesting to see if it can hold its own with other sources of "fixed" nitrogen, or natural nitrates from Chile, or can even encourage or point the way to further and similar activity.

## Pipe Protection by Magnesium

Corrosion engineers are becoming increasingly interested in the possibilities of magnesium for preservation of underground ferrous structures by "cathodic protection." Magnesium, when coupled with iron in an electrolyte, develops a relatively high voltage, the iron being negative or receiving current in the internal circuit. In practical application bars or rods of magnesium are buried in the soil adjacent to the pipe line, and connected to the line by an insulated wire. The earth serves as the electrolyte and current flows from the magnesium through the soil to the pipe which, if sufficient current flow can be maintained, prevents corrosion of the pipe by affording "cathodic protection". The protection is obtained at the expense of the magnesium which gradually corrodes or wastes away.

Certain practical considerations appear to warrant reasonable caution at the present time, but application may be extended as more experience and knowledge is gained. One possibility is that the magnesium rods may become covered with a scale of corrosion products, over a period of years, particularly in certain soils, with resultant lowering or cessation of current output. This and other reasons may make the life and performance of the rods somewhat less than theoretical. However, experiments with artificial backfill with which to surround the rods when installed in the soil are encouraging.

Reports and appraisals to date indicate that where the current requirements are great, as with poorly coated or bare pipe, a relatively large number of rods or "anodes" are necessary per unit area of pipe surface, to keep within the current delivering ability of the magnesium; such conditions would seem unfavorable to efficiency and long life, and would also make the overall installation expense approximate that of more conventional means of applying such protection with purchased or generated energy.

The most attractive application of these so-called galvanic anodes at the present time appears to be to well insulated structures, where the electrical protection is used to supplement the coating and prevent corrosion at the few weak spots which seem unavoidable regardless of how carefully a pipe line is coated and installed. For a pipe line that has a good and substantially continuous electrically insulating coating, it seems possible that cathodic protection can be provided by magnesium for a period of 10 years or more by the equivalent installation of one 20-lb. rod per mile of 12-in. diameter pipe. Present prices for magnesium in suitable rod form are within 25 to 30 cents per lb. Installation is relatively simple and maintenance should be negligible.

## What the Gas Industry Needs Is . . .

We are hearing rather frequently that, when the technical and scientific developments from the latest war are made available and in production and use by industry, there will be amazing revolutions and improvements in materials and methods; and we are given hints of research and sales organizations feverishly seeking outlets for these war-born products.

Might it not be advisable for the gas industry to meet these efforts at least half way by stating or even advertising its needs, in such manner as to reach the attention of these custodians of technical advancement? And might it not even be justified, in a reasonable degree, to provide practical cooperation in terms of financial assistance or laboratory facilities, where the costs of development to the gas industry's use may be formidable?

It is always surprising to learn how little an outsider knows of our industry's problems, even generally and much less in detail, and to discover that he even has difficulty in deciding how to go about finding out. Because of this, a deliberate approach to him might produce gratifying results.

# DOMESTIC GAS RESEARCH BULLETINS

## Research Bulletin No. 35

### Oven Heat Distribution in Domestic Gas Ranges

**The 23rd formal publication based on results of research conducted at the A.G.A. testing laboratories, and the tenth in a series on domestic gas cooking research. This bulletin deals with problems encountered in the attainment of uniform heat distribution in gas range ovens. Experiments reported on in the pamphlet were conducted by M. E. Ward, Evelyn Murphy, and Gladys McKeever. Price of this bulletin is $1.25.**

### A. Effect of Oven Constructional Changes

1. Changes in vent openings around the oven bottom produce definite effect trends on color of cake surfaces. Most pronounced are the effects of a decrease in width of side openings as evidenced by darker cake surfaces if a front opening is provided and decidedly lighter surfaces when no front opening is provided. Blocking the rear portion of the side openings caused the bottom surface of the cake at the front of the upper rack to become considerably darker in color. Variations in reflectance as great as 6 to 8 per cent may be expected with oven bottom vent opening changes.

2. Location of vent opening in side walls with respect to the oven bottom appears to influence the color of individual cake surfaces rather than to indicate a general trend. Raising the outlets of these side vent openings resulted in decided darkening of two cake surfaces, the bottoms of the front cakes on the lower rack, and the bottoms of the rear cakes on the upper rack. These variations were indicated by a 9 and 10% average reflectance change, respectively.

3. Flue outlet changes are most significant when the flue area is decreased and when the flue opening is spread over a wider area in the oven top with no change in total flue area. In both cases a decided lightening of cake surfaces can be expected, being as much as 10% in variation of light reflectance.

Changes brought about by lowering the rear flue outlet and moving the top liner flue outlet forward produce less positive trends but the variations noted were towards darker cake surfaces.

4. Lighter cake surfaces, especially bottoms, result from an increase in oven bottom insulation. Bottoms of cakes on lower rack show increases in light reflectance as high as 9%.

5. Definite darkening of the front cakes occurs when the oven burner is moved forward, the bottom surfaces with a 7.5% reflectance variation exhibiting the more pronounced effect. Increasing the vertical distance between the burner and the oven bottom results in lighter top surface colors of all cakes. The bottom surfaces do not follow any definite pattern, some being lighter and others darker in color.

6. The degree of overshoot, or the absence of any overshoot, in oven temperature due to thermostat bulb location or shielding is reflected in the color of cake surfaces. As logically would be expected overshoot results in darker cakes, the greater the overshoot the darker the cakes. Where there is no overshoot the cakes are lighter in color. The overshoot referred to is that resulting from placement of cakes in the preheated oven.

7. Cakes baked in ovens controlled by snapacting thermostats compare favorably with those baked under graduating thermostat control.

8. Raising the bottom rack or lowering the top rack produces marked changes in oven heat distribution. In the former case the cakes on the bottom rack become lighter in color while the top rack cakes are darker. In the latter case the surfaces of the cakes on the bottom rack again become lighter in color while the top rack cakes change in color in an unpredictable manner.

9. Changes in oven burner gas input rate have very little effect in distribution of heat in an oven except at rates too low to maintain the oven at its baking temperature.

10. Where openings that supply secondary air for the oven burner are concentrated in one particular section of the burner box, it was found that the cakes located directly above such openings display a tendency to be darker in color. Where secondary air enters the burner box through more uniformly distributed openings this condition was not in evidence.

11. Polished or dull interior oven surfaces have no effect on oven heat distribution.

### B. Effect of Changes in Operating Conditions, Test Procedures and Test Equipment

1. Tilting the ranges into off-level positions by elevating one side did not upset oven heat distribution except in extreme off-level positions. Tilting ranges from front to back or back to front, however, produced upsets in distribution of heat sufficiently strong to indicate that care should be exercised in installing ranges in a level position.

2. The length of time the oven door is left open while placing food in the oven, up to one minute, did not change heat distribution sufficiently to effect final results in cake color. For conventional thermostat bulb locations, at the top of the oven, the degree of overshoot did not exceed 15° to 20° F after the oven door was left open for one minute.

3. Variable amounts of leakage of flue products into the room due to a poor fitting oven door definitely alter the pattern of heat distribution in the oven. However, the change in distribution does not follow any noticeable trend, resulting sometimes in better and sometimes in worse distribution.

4. Within very reasonable limits, variations in the sugar and fat content, temperature, or weight per cake of the standard cake batter did not affect the color of the cake.

5. When cakes are baked from a cold start instead of first preheating the oven the results are practically the same provided the time of baking is increased slightly over that required with a preheated oven. Gas consumption when baking in a preheated oven is somewhat greater than when baking without preheating, being approximately 15% greater when the oven is preheated for 15 minutes.

6. Positioning of cakes in the oven, relative to each other and to the oven walls, has an important bearing on heat distribution. When moved closer to the walls than the prescribed distance, uniformity of distribution is up-

set materially. The same is true to an even greater extent when moved closer to the front than the correct distance. When moved farther than the normal distance from the side walls very little change in heat distribution takes place.

7. When the number of cakes per "bake" is reduced from four to three or two, the effect on the distribution of heat is plainly evidenced by the fact that the bottom surfaces of the cakes, especially those on the lower rack, become much lighter in color. The uniformity of heat distribution, however, is improved since the difference in per cent reflectance between the lightest and darkest portions of each "bake" of three or two cakes is generally less than when 4 cakes are baked.

8. The color of a cake bottom is influenced proportionally by the ability of the outside surface of the cake pan to absorb heat. An equation has been developed establishing a relationship between the color of the cake bottom and the absorptivity coefficient of the outside surface of the pan bottom. In general, for metal pans, the brighter and more polished the surface, the lighter the color of the cake bottom.

9. After approximately 20 minutes in the oven the rate of darkening of the bottom crust of standard test cakes is greater than that of the top crust when the cakes are baked in aluminum or tin pans. As the tops tend to "brown" first it is possible to decrease the difference in color between the top and bottom crusts by prolonging the baking time. Moreover, as baking time and temperature independently exert an influence on rate of color darkening, it is possible by combining these variables to bake cakes whose top and bottom surfaces are closer to the same color.

10. It was found that when heat distribution is such that an oven will satisfactorily bake standard test cakes, it also is flexible enough in operation to produce good quality baked goods of any type.

### C. Study of Use of Artifical Cakes for Determination of Oven Heat Distribution

1. "Aluminum disc cakes" were developed for use in place of actual cakes for determining the change in or trend of heat distribution resulting from changes in oven construction. This substitution is made possible by the development of relationships or ratios between surface temperatures of the aluminium "cakes" and reflectance values of surfaces of actual cakes. These relationships permit conversion from surface temperature readings to reflectance readings with an acceptable degree of accuracy.

2. Special "paper cakes" were also developed for use in a manner similar to that for "aluminum cakes." Actual reflectance readings of the "paper cakes" can be taken, however, and a correction applied to convert the reflectance value so obtained to that of an actual cake under the same oven conditions.

3. The use of color charts affords a quick and easy method to determine the approximate reflectance value of cake surfaces. They are not intended, however, to replace the use of the much more accurate reflectometer but rather to standardize and aid the visual inspection necessary where a reflectometer is not available.

## Research Bulletin No. 36

### Interchangeability of Other Fuel Gases With Natural Gases

**The extension and expansion of natural gas transmission systems into relatively distant areas has continued until at the present time gas pipe line networks are serving numerous urban areas, both large and small, throughout the country. It has been necessary at many of these locations to develop means for obtaining or producing supplemental or substitute gases to provide a continuity of gas supply to satisfy fully fuel demands during peak load periods or to insure against occasional interrupted gas deliveries resulting from transmission difficulties. In 1942 a program of intensive research was initiated by the Managing Committees of the Natural Gas and Technical Sections, together with the Technical and Research Committee of the Natural Gas Section of the American Gas Association, to develop a means for reliably predicting the combustion characteristics of typical gases when used as supplemental or substitute fuels. It was also the intent of the committees to extend the scope of the investigation to include the development of a flame characteristic burner for providing a practical means of observing the quality and suitability of mixed send-out gases. This bulletin represents the first publication based on the present research with natural gases. Price of the bulletin is $2.50.**

### Summary of Results

1. When heating value and specific gravity of the supplemental gas caused a decrease in input rate of appliances, there was a tendency toward flash-back or lifting flames. Flash-back was the objectionable feature with carburetted water gas, coke oven-natural gas, butane-reformed butane and butane-blue gas mixtures. Unsatisfactory performance from the standpoint of lifting was encountered with butane-air and butane-producer gas mixtures.

2. When heating value and specific gravity of the supplemental gas caused an increase in input rate of appliances, there was a tendency toward yellow tips and incomplete combustion.

3. Yellow tipped flames always occurred on some control appliances when the percentage of propane in the substitute gas was 50% or higher, or the percentage of commercial butane was 40% or higher, or the percentage of unsaturated hydrocrabons was above 20%. Commercial liquefied petroleum gases having different chemical compositions may give slightly varying values.

4. The tendency of appliances to operate wth yellow tips, flash-back and lifting on substitution of high Btu mixed gases was found to be dependent also upon the kind of base natural gas used in making the original adjustments of the appliances.

5. Pilot performance was always satisfactory when sufficient base gas was added to the supplemental gas to correct the flame characteristics on all control burners.

### Conclusions

1. The test appliance burners with the most critical adjustment with respect to lifting and yellow tips on the adjustment gas are employed to determine the limits of interchangeability and percentage of supplemental gas which can be used on the test appliances.

2. The percentage of supplemental gases which can be added to the various natural gases without affecting appliance operation is dependent to a great extent on the composition of the original base load gas. Appliances adjusted on gases which have a relatively low primary air factor, such as high Btu natural gas with a primary air factor of 0.717, will have greater flexibility when operating on high heating value substitute gases than appliances adjusted on base load gases such as high methane or high inert natural gases with higher primary air factors.

3. By application of the lifting, flash-back and yellow tip interchangeability equations derived herein, the degree of interchangeability of supplemental gases with natural gases can be readily determined. These equations do not supersede the A.G.A. interchangeability index "C" which may still be used for gases having heating values less than 800 Btu per cu. ft. However, it is felt that the equations will be applicable for determining interchangeability of gases with manufactured gases following research to define the numerical limits of "$I_L$" "$I_F$" and "$I_Y$" within which satisfactory performance can be ex-

pected. Further research is likewise necessary to determine the limits of interchangeability when high heating value mixed gases (approximately 800 Btu per cu. ft.) are supplied as the normal base load gas.

## Research Bulletin No. 37

### Primary Air Injection Characteristics of Atmospheric Gas Burners (Part 2)

**The findings in this bulletin supplement those included in Bulletin No. 26, which carries the same title. It is the ninth in a series dealing with gas burner research. Work reported in this bulletin was directed toward revealing the fundamental manner in which individual components of burner design affect primary air entrainment, thereby providing a basis for design not necessarily limited by commonly accepted standards of good practice. Price, $1.50.**

*Results:*

1. Primary air entrainment of atmospheric gas burners may be expressed as a function of mixing tube design (including the factors of throat diameter and venturi slope) and of port area design (including throat to port area ratio, port size and port depth). These factors were combined in an empirical relationship (see equation 8) which also takes into account the nature of the gas supply.

2. The effect of increasing throat diameter on primary air injection diminished as the venturi slope was increased from 2 to 6 deg. with throat sizes from ½ to 1 in.

3. Effect of venturi slope in the range of 2 to 6 deg. on primary air injection increased as the throat diameter increased with open end tubes.

4. Primary air injection with venturi slopes of 4 and 6 deg. was greater with the burner head attached to the open end tubes at low throat to port area ratios (0.1) than with open end tubes alone.

5. Injection becomes independent of port size after the port size is increased to a certain value (total port area being maintained constant). This value is a function of port depth, decreasing as the port depth is reduced.

6. Primary air injection was found to be inversely proportional to the 0.45 power of the gas input rate rather than the square root or 0.5 power of the gas input rate as called for by the momentum relationship from which the final injection equation was derived.

*Conclusions:*

1. With the aid of the empirical relationship for primary air injection derived from this investigation, primary air injection characteristics may now be predicted more accurately over a greater range of burner design factors than has been possible heretofore. Thus the designer is provided with greater flexibility in solving problems of modern gas burner design.

2. Substantiating findings of previous investigations, a 2 deg. venturi slope is still considered the optimum condition for primary air injection. This conclusion holds true within the broader scope of burner dimensions covered by this investigation.

## Research Bulletin No. 38

### Fundamental Data For Design of Totally Aerated Atmospheric Gas Burners

**This bulletin, the tenth in a series of A.G.A. treatises on the subject of burner research, deals with the establishment of certain flame characteristic limits and the importance of these limits when applied to burners injecting all air for combustion as primary air. It includes data from the laboratories as well as from outside sources. R. C. Weast, Jean McCarthy, and E. J. Weber conducted the experimental work. Price $1.25.**

### Summary of Results

1. Flash-back tendencies increase with an increase of the air-gas mixture temperature inside the burner head. The maximum gas input rate at which a mixture of air and manufactured gas flashes back at 800° F is approximately 1.5 times as great as the rate at which the same air-gas mixture flashes back at room temperature. For butane-air and natural gas-air mixtures, the maximum gas rate at which the mixtures flash back at 800° F are approximately 1.8 times as great as the rate at which the same air-gas mixture flashes back at room temperature. These ratios of rates are the same for either No. 26 or No. 36 DMS ports.

2. The maximum gas input rate beyond which no flash-back occurred for the various coke gas-air mixtures studied was obtained at primary aerations of approximately 75 to 85%.

3. At 800° F the tendency of a gas to flash-back is independent of distance between the ports. Investigations were made with burners which had very carefully spaced ports and whose port distances were varied from 0.02 to 0.50 inches, center to center.

4. Propensity toward flash-back with fast burning gases increases with port diameter. Port sizes from No. 26 to 50 DMS illustrate that with a fast burning manufactured gas the increase in maximum gas input rate beyond which flash-back would not occur yields a smooth curve when port diameter is plotted against input rate per sq. in. port area.

5. Increase of port depth produces a decrease of flash-back tendency of an air-gas mixture. These data illustrate that there is only slight advantage to be gained by having the port depth greater than ¾ in.

6. The variation in composition which is most likely to affect the position of the flash-back limit is a change in the proportion of hydrogen in the mixture.

7. Raised ports have no noticeable

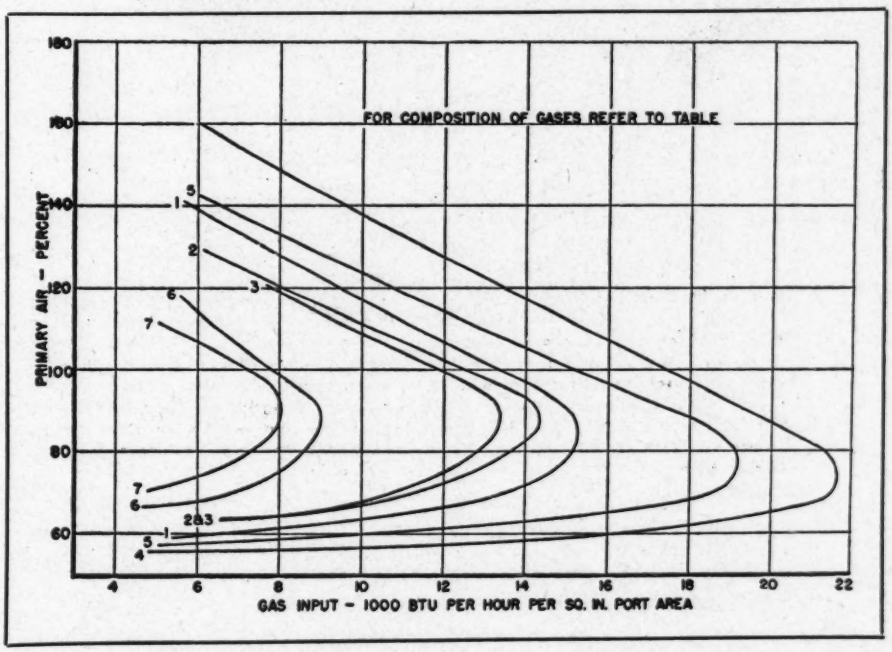



FIG. 1. Flash-back limit curves of gases of known composition.

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**THE COMPLETELY AUTOMATIC CONVERSION GAS BURNER**

**TABLE I—COMPOSITION OF SPECIALLY PREPARED GASES EMPLOYED IN THIS STUDY**

| *Test Gas No.* | *% $H_2$* | *% CO* | *% $CH_4$* | *% $N_2$* | *% $C_3H_8$* | *Sp. Gr.* | *Heating Value* |
|---|---|---|---|---|---|---|---|
| 1 | 64.4 | 0 | 28.6 | 5 | 2 | .314 | 552 |
| 2 | 50 | 14.4 | 28.6 | 5 | 2 | .443 | 552 |
| 3 | 30 | 34.4 | 28.6 | 5 | 2 | .623 | 552 |
| 4 | 72 | 0 | 17.2 | 5 | 6 | .301 | 551 |
| 5 | 36 | 36 | 17.2 | 5 | 6 | .624 | 551 |
| 6 | 53.8 | 0 | 26.2 | 10 | 0 | .373 | 550 |
| 7 | 20 | 33.8 | 36.2 | 10 | 0 | .676 | 550 |

effect on flash-back limits.

8. In an effort to design a burner which would inject at least 100% primary air at elevated burner temperatures and under "turn-down" conditions several expedients were used.

a. Division of burner head into individual sections to which gas supply may be shut off separately.

b. Employment of a number of individual injection tubes leading to one burner head together with a specially designed valve which shuts off the supply of gas to each tube. In this way the rate per sq. in. of port area is reduced as usual at turn-down, although air injection actually increases. Care must be exercised with this type of burner to provide good distribution in the burner head to prevent formation of areas where the rate per port approaches zero, thus providing an ignition source for flash-back.

9. The burners described above in Sec. 8b failed to meet American standard approval requirements relative to one-fifth turn-down of full input rate. The burner described in Sec. 8a would perform satisfactorily at turn-down but would require a special valve. In laboratory experimentation the flow of gas to each of the individual sections was shut off by an individual valve.

### Conclusions

1. In order to prevent flash-back of fast burning gases at low turn-down rates with drilled port burners having input rates comparable to those encountered in contemporary partially aerated burners, it is necessary to inject considerably more air than that theoretically required for complete combustion. The amount required in excess of theoretical needs is dependent upon the type of burner, its temperature, and the type of gas.

2. Data obtained indicate that factors other than ignition velocity of the air-gas mixture contribute to the flash-back tendency of a gas. These factors may include density, thermal conductivity, heat capacity and spontaneous ignition temperature of the air-gas mixture.

3. Data in Table 1 and Fig. 1, compiled to supplement findings in Bulletin No. 34, make it possible to estimate probable flash-back limits of fast-burning gases at elevated temperatures. The data did not lend itself to mathematical treatment.

4. Expedients for overcoming inherent obstacles in the design of totally aerated burners indicate solution of the problems for limited applications.

## Research Bulletin No. 39

### Fundamentals of Heat Absorption by Utensils In Gas Range Ovens

**Herein is provided quantitative information to show the relationship between kind of utensil, kind of oven, oven temperature, oven loading, and heat absorption. Data abstracted from previous research bulletins and other sources are included to provide a general treatise on the subject of heat transfer in domestic gas range ovens. This is the 11th in a series of bulletins devoted to gas cooking.**

### A. Effect of Kind of Utensil on Heat Absorption in Ovens

1. Water in 2 sizes of aluminum pans with exterior surfaces painted dull black heated from 1.75 to 1.98 times as fast as water in the same aluminum pans with highly polished external surfaces, the larger aluminum pan showing the greater increase.

2. An even further increase in heating speed was observed when water was heated in a glass baking dish and in an identical dish plated with silver on the outside. The baking dish with the conventional finish heated 2.36 times as fast as the dish with the polished silver plated finish at an oven temperature of 400° F.

3. The percentages of radiant heat absorbed by the various utensils at an oven temperature of 400° F was as follows: 43.0 per cent by the small aluminum pan painted black, 50.0 per cent by the large aluminum pan painted black, and 57.6 per cent by the glass baking dish.

4. Studies conducted with an experimental highly polished chrome plated copper utensil holding temperature rise constant by use of a steady flow of water through the utensil gave the following results:

a. At an oven temperature of 400° F, 2.14 times the amount of heat was absorbed by the above utensil when painted entirely dull black as was absorbed by the shiny chrome plated finish.

b. Painting only the bottom of the pan black caused an increase in heat absorption of 39.3 per cent over that of the shiny pan, while painting the sides of the pan black in addition to the bottom raised this percentage increase to 65.0 per cent.

c. Of total heat absorbed at 400° F the percentage radiant was: 28.2 per cent when the bottom was black and the top and sides shiny, 39.5 per cent when only the top was shiny, and 53.3 per cent when the pan was completely blackened.

5. Tests were conducted to determine the oven temperature necessary to roast beef in a silver plated glass baking dish to the same internal temperature as an identical roast in a plain glass baking dish in a 300° F oven. Data indicated that for an equivalent roasting period an oven temperature slightly higher than 380° F would be required for the roast in the silvered dish.

6. Cakes baked in pans with surfaces of varying absorptivities showed the following effects:

a. When the various surfaces were applied to the inside of the bottom plates of cake pans, no change in color of the cake bottom surfaces was noted.

b. When the various surfaces were applied to the outside of the bottom plates, a definite relationship was found to exist between the color of the bottom of the cake and the absorptivity coefficient of the surface employed. Highly polished metal surfaces produced cakes with bottom crusts lighter in color than cakes baked in pans with oxidized or painted exterior surfaces.

c. Irrespective of the type of surface used for the bottom of the pan, the color of the top surface of the cake was not affected in any way.

7. Tests conducted with 10 in. square sheet steel pans varying in height from 2 to 8 in. with pan loadings proportional to the height showed that efficiency increased from a value of 17.0 per cent with the 2 in. high pan to 22.2 per cent with the pan of 8 in. height. Heating speed however decreased from 0.663 to 0.0675 degrees per minute per pound of water as the height of the utensil was increased from 2 to 8 in.

8. The bottom area of the pan affected efficiency and temperature rise as follows when the pan load per unit area of the bottom was constant.

a. Varying the area of the bottom of the pan from 16 to 169 sq. in. increased the efficiency from a value of 8.9 to 25 per cent.

b. At the same time, temperature rise of water dropped from 2.71 to 0.0987 degrees per minute per pound for these same utensils.

9. For any given oven loading, the utensil having the greater bottom surface area was the more efficient in that a greater quantity of heat was absorbed during a given period of time. Foregoing results also indicate that utensils having surfaces of high heat emissivity are most effective in absorbing heat.

### B. Effect of Kind of Oven on Heat Absorption by Utensils

1. The rate of heat absorption for the small aluminum pan was slightly higher in a chrome plated oven than in the same oven coated with lamp black, regardless of whether the utensil finish was shiny or dull black.

2. In the case of the large aluminum pan, the black oven finish gave a higher rate of heat absorption than the chrome oven finish. Further, the per cent of increase in heating speed due to the blackened oven was considerably greater for the pan with the black finish than for the same pan with the shiny finish.

3. Further tests were made with the small aluminum pan placed inside the large aluminum pan, the large pan being considered as an oven. In accordance with established trends, it was noted that as the size of the utensil (small pan) approached the size of the oven (large pan) the rate of heat absorption of water in the utensil increased when the oven finish was black.

4. Blackening the sides of the chrome plated oven did not increase the amount of heat absorbed by a shallow pan.

5. At an oven temperature of 400° F, the percentage increase in efficiencies obtained with the black oven and the oven with black bottom and chrome sides over that obtained with the chrome oven were 6.7 and 13%.

6. Interior finish of the oven had no effect on reflectance readings of cake surfaces.

7. Slightly more effective and efficient heating was obtained when flue gases were passed through the oven than when flue gases were passed around the oven walls.

### C. Effect of Oven Temperature on Heat Absorption by Utensils

1. Data indicating the effect of oven temperature on heat absorption showed that the percentage of radiant heat absorbed by a large glass baking dish varied from 47% at 300° F oven temperature to 69.5% at 600° F.

2. It was found that a mathematical relationship could be expressed between oven temperature and temperature rise of water in the utensils.

### D. Effect of Oven Loadings on Heat Absorption by Utensils

1. Temperature rise per minute of water in utensils decreased considerably as the load increased.

2. The quantity of heat absorbed per minute was somewhat greater for heavier pan loadings.

3. The same total load heated much faster in the large aluminium pan than in the small aluminum pan.

4. An average of 2.76 times as much heat was absorbed per minute by the large aluminum pan as by the small aluminum pan when equal surface areas of the two pans were in contact with the water (sq. in. per lb. of water), indicating greater effectiveness of the oven bottom over oven sides in transmitting heat to the utensil.

### E. Miscellaneous

1. In limited tests conducted, the following procedures influenced very little the amount of heat absorbed by water in utensils:

a. Changing position of pan in oven.

b. Conducting tests with pans covered or uncovered, or

c. Placing pan on asbestos strips to avoid contact with oven rack.

2. Water in a small aluminum pan heated only 63% as rapidly as water in a small glass baking dish of approximately the same size.

3. Oven interior finish had no effect on oven maintaining rates when there was no load in the oven. With a load, the black oven was found to require a higher maintaining rate than the oven with the black bottom and chrome sides.

4. A 6 lb. oven load caused the oven maintaining rate to increase from 5700 Btu per hr. with no load to 800° Btu per hr. A further average increase in oven maintaining rate of 147 Btu per hr. was noted for each added pound of loading over 6 lb.

5. Temperature of the oven interior walls was found to be affected not only by the oven interior finish but also by the oven loading.

a. Addition of a 15 lb. load increased all wall temperatures in the shiny oven. At 500° F oven temperature, the increase in temperature of the side walls with the load in the oven was 147 degrees, the back walls 30 degrees, and the oven bottom 18 degrees.

b. In the black oven, the greatest increase in temperature due to loading was noted in the oven bottom. At 500° F, the temperature of the oven bottom increased 100 degrees with the load in the oven, the sides 70 degrees, while the temperature of the back wall was about 2 degrees lower with the load.

6. Use of highly reflective surfaces on oven door inner linings was accompanied by reductions in rises of average and maximum external surface temperatures along the top half of the oven doors of 26 and 22 per cent, respectively. The average decrease in average surface temperature was 23° F from an initial temperature rise of 89° F. These values were obtained with 400° F oven temperature.

## Research Bulletin No. 40

### Study of Various Methods of Kitchen Ventilation

**Experiments reported in this bulletin were begun in June of 1944, at the recommendation of the technical advisory group on Domestic Gas Research. Members of the laboratory's staff who worked on this project included W. F. Swink, R. C. Gregg, and Winifred Anderson. Price, $1.25.**

Studies were made on removal of heat, moisture, and cooking odors produced by cooking operations. Four general types of kitchen ventilating hoods were investigated, namely cabinet, wall, canopy and Rochester types. Several modifications were made in their original construction in an effort to determine the most effective design. Studies were also conducted on effect of operation of a gas refrigerator on kitchen temperature, and on grease deposition in ventilation systems.

### A. Heat Removal

A method for analyzing the efficiency of heat removal from the kitchen was developed. It consisted of determining the dry bulb temperature differential between exhaust air and average room temperature together with the rate of air withdrawal. Results obtained with different types of ventilating hoods are summarized as follows:

### 1. Cabinet Type Hood

a. Variations in the height of ventilating hood openings (bottom of cabinet directly above range) from 18 to 42 in. above range top indicated no appreciable change in heat removal at an air withdrawal rate of 900 cfm.

b. At a more practical air withdrawal rate of 270 cfm, varying height of ventilating hood openings from 18 to 42 in. indicated that most effective removal of heat resulting from oven operation was obtained at the lowest elevation. However, best results were obtained with a hood height of 30 in. for top burner operation, with only a small decrease in heat removal efficiency for top burner and oven operation.

c. Location of openings across front, rear, or sides of cabinet bottom directly above the range had little effect on efficiency of heat removal. There was, however, some advantage in having the openings on sides of hood bottom in the case of divided top ranges.

d. Efficiency of heat removal increased as area of hood openings increased until an optimum area for each type of opening was reached. Thereafter, efficiency decreased slightly.

e. Addition of a 2 x 24 in. horizontal opening to the front of the cabinet at ceiling level and directly above the range improved efficiency of heat removal from the front top burners by only a very small amount.

f. Directing flow of air in the kitchen toward the hood by means of an auxiliary fan did not improve efficiency of heat removal.

g. Replacing the slotted openings and squirrel cage blower used heretofore with an impeller type fan unit had no appreciable effect on efficiency of heat removal at low air withdrawal rates of 190 cfm or less. Comparison of results, however, is impractical as the capacity of the fan was not great enough to conduct the tests at higher rates of air removal employed with slotted openings.

h. Maximum heat removal attained by use of a cabinet hood was 36 per cent for oven two front burners and 55 per cent for oven and two rear burners at 300 cfm. Correspondingly higher efficiencies were attained at higher rates of air withdrawal.

### 2. Wall Type Hood

a. Variations in height of wall hood openings from a point adjacent to the top of back splash to 24 in. above the range top did not exert any appreciable effect on effectiveness of heat removal.

b. Extension of a horizontal outlet by providing a 2 x 36 in. channel, 6 in. long directed downward toward the range top at a 45 degree angle did not improve efficiency of heat removal from front top burners.

c. Individual hood openings for each section of a divided top range were slightly more effective than a single slot extending full width of the range. On the range employed these individual openings were also located directly above vents from the oven.

d. Maximum heat removal attained with the wall type hood was 26% for oven and 2 front burners and 46% for oven and 2 rear burners at 300 cfm. Correspondingly higher efficiencies were attained at higher rates of air withdrawal.

### 3. Canopy Type Hood

Use of the canopy hood covering the entire range at head level showed no appreciable advantage over the cabinet or Rochester types. Lowering the canopy to a 12 in. height above the range top increased effectiveness of heat removal from the top front burners considerably above that attained with the Rochester system or the cabinet or wall type hood. Efficiencies of 66% for oven and two front burners and 62.5% for the oven and two rear burners were attained at 300 cfm.

### 4. Rochester System

a. Heat removal efficiencies declined with increasing quantities of heat produced, but improved with increasing rates of air withdrawal.

b. Higher efficiencies were obtained for the back burners than for the front burners, at any given air withdrawal rate.

c. Oven heat removal efficiency increased with increasing rates of air withdrawal until a value of 70 per cent was attained at a rate of 250 cfm. Further increase in air removal rate did not improve efficiency but continued to increase oven maintaining rate.

d. The Rochester system, as installed and employed in this investigation, required greater gas consumption to maintain the oven at any given temperature. The gas consumed was proportional to the air withdrawal rate. It should be possible by more accurately designing the built-in draft diverter to eliminate this undesirable characteristic.

e. Maximum heat removal attained was 36 per cent with oven and two front burners and 55 per cent for oven and two rear burners when the system was exhausting air at a rate of 300 cfm.

### 5. Comparison of Systems

Heat removal effectiveness of the Rochester and cabinet systems appeared about equal when all four systems studied were compared for an air withdrawal rate of 300 cfm. These data are summarized as follows:

| | Percentage of Heat Removed with Air Withdrawal Rate of 300 cfm | |
|---|---|---|
| | *Oven and 2 Front Burners* | *Oven and 2 Rear Burners* |
| *Type of System* | *27,000 Btu Per Hr. Input* | *22,000 Btu Per Hr. Input* |
| Wall | 26 | 46 |
| Cabinet | 36 | 55 |
| Rochester | 36 | 55 |
| Canopy (12 in. clearance) | 66 | 62.5 |

### B. Moisture Removal

Removal of moisture was investigated with 4 types of ventilating hoods using two 9 in. diameter water-filled pans over the front or rear top burners. The following results were recorded:

1. All 4 types of ventilating systems were more efficient from the standpoint of removal of moisture than of heat.

2. At an air withdrawal rate of 300 to 400 cfm the four types of ventilating hoods were practically 100% efficient in removing moisture from pans over the rear burners together with water vapor produced by combustion of gas. Under reasonably similar conditions, moisture removal from the front burners was 73, 55, 100 and 79% for cabinet, wall, and low canopy type hoods and the Rochester System respectively. By incorporating an additional opening in the cabinet type hood just below ceiling level, efficiency of moisture removal was increased to 84%.

### C. Odor Removal

Removal of cooking odors was investigated with wall and canopy type ventilating hoods and at various rates of air withdrawal. The following results were obtained:

1. Odors from roasting meat in the oven were entirely removed at air withdrawal rates of 300 cfm or more.

2. Cooking odors from cauliflower, onions, and meat prepared over top burners could not be entirely removed from the kitchen at rates of air withdrawal as high as 900 cfm. However, at rates of 300 cfm a considerable amount of the cooking odors was confined to the kitchen when inlet air was drawn through the kitchen doorway.

### D. Gas Refrigerator Operation

Kitchen temperature was maintained at a satisfactory level with a gas refrigerator in operation by permitting the flue products to enter the kitchen through a rectangular slot at ceiling level, mix with kitchen air, and be drawn into the ventilating system.

### E. Grease Deposition

There is little deposition in ventilating ducts produced by greasy vapors or smoke from hot cottonseed oil that enter the system. However, droplets of cottonseed oil caused by splattering will accumulate in the system particularly in the portion of the system nearest to the range.

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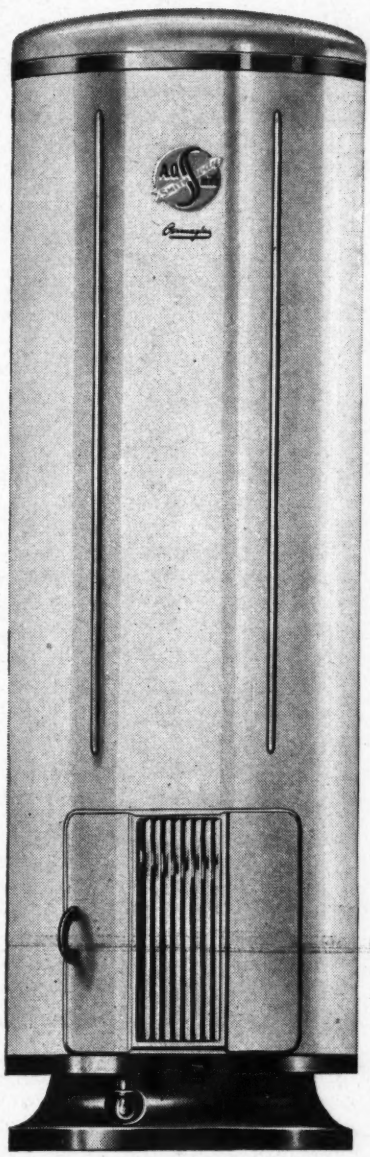

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# USE of a RUBBER BALL

## To Clean The Interior of a Gas Pipe Line

By HARRY J. KEELING

**Mechanical Engineer, Southern Counties Gas Company of California**

THE problem of cleaning the interior of transmission pipe lines to improve the friction factor has been engaging the interest of engineers for many years. One of the successful devices developed for the purpose of cleaning water or oil pipe lines consists of a hollow rubber ball with a chain armor on the exterior. This Rotary Pipe Crawler, as the manufacturer calls it, has not been so extensively used on gas pipe lines, however. Several years ago, the Southern Counties Gas Co. had an opportunity to try out this device in connection with cleaning operations on a 16-in. gas transmission line near Ventura. Although the test was rather brief, it may be of general interest to describe this work for the benefit of others in the gas industry.

Before discussing the test, let us first consider in a general way the pros and cons of the various cleaning methods available to the gas line operator.

There is a considerable difference in the type of internal cleaning necessary for different conditions. Some lines become filled with large quantities of sludge or dirt. On the other hand, where conditions are more favorable, the interior may be clean except for a light coating of rust on the pipe surface. In our particular case, the requirements for the job were as follows:

1. The cleaning process should remove a light coating of dry rust from the inside of the pipe, and possibly small deposits of scale and sludge in the low spots.

2. The pipe line should not be out of service for more than a few hours at a time since downstream consumers depend upon "line-pack".

3. Since this was an old line constructed with mitered angles as large as 90°, any device used in the interior must be able to pass readily around such corners.

4. It was known that this line contained welding "tear drops" and other projections hanging from the top of the pipe at the welded joints. These would have to be taken into consideration in choosing devices to pass through the interior.

5. The cleaning method should not be hazardous to life or property.

6. The cleaning method should be reasonable in cost.

### Review of Pipe Cleaning Methods

*"Go Devils" or Scrapers*: It has been fairly common practice to clean sludge or dirt from the interior of pipelines by means of a "go devil" or scraper which is forced through the line by the pressure of the liquid or gas behind it.[1,2,3] A typical "go devil" consists essentially of a metal cylinder several pipe diameters in length to which is attached scraper blades, hooks, or brushes which bear against the interior surface of the pipe. The scraper blades may be mounted at an angle so that the device rotates as it progresses through the line. Rust and dirt are loosened and removed by the shearing action of the blades.

The forward propelling force produced upon the "go devil" as a result of the pressure differential across it is considerable. In a 16-in. line this force amounts to about one ton with a 10 psi differential. The large power available for useful work makes this device desirable from the designer's standpoint.

The speed of a "go devil" used in a liquid line may be controlled fairly well by the rate of pumping; in a gas filled line, however, it is not quite so easy to control the speed of the cleaning device. Our problem was made rather difficult by the fact that requirement (3) in the above list made it necessary to use a device capable of passing around sharp right-angle bends. Since conventional scrapers are constructed in one piece and will not traverse sharp bends, we felt that it would be necessary to develop a modification of existing designs to meet this requirement.

Several small experimental "go devils" with articulated bodies were designed and tried out in the laboratory. These models were tested in 2 in. pipe and successfully passed around 90° miter corners. The final design consisted essentially of a solid rubber ball trailing behind it several spherical-shaped sets of cutters and brushes, which scraped and brushed the pipe walls.

*Rubber Balls*: Following the successful development of the small articulated "go devils," it was decided to attempt construction of fullsized equipment for cleaning 16-in. pipe. When local rubber manufacturers were contacted regarding the construction of larger rubber balls, we learned that there was already on the market a complete line of collapsible rubber balls especially designed for pipe cleaning.[5] These balls or "Rotary Pipe Crawlers" are constructed of heavy rubber completely covered with a chain link armor. (see Fig. 1) The chain performs the dual function of

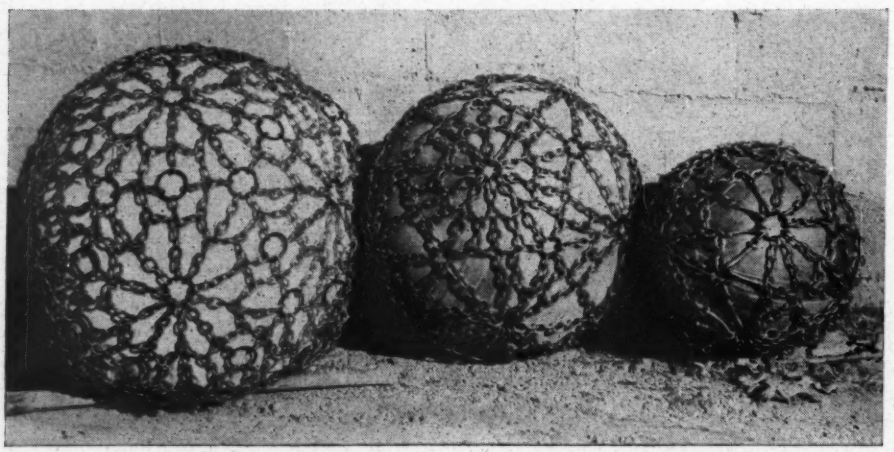


**Fig. 1. Rotary pipe crawlers for cleaning piping. Sizes shown, 30-in., 24-in. and 18-in.**

reinforcing the rubber and acting as a scraper to scour the inside surface of the pipe. The Rotary Pipe Crawler was primarily designed to cut out tree roots, or to remove slime, silt, rust or incrustation accumulating in liquid lines. Fig. 2 illustrates the manner of using the pipe crawler in a conventional water line.

### Rubber Balls vs. Go Devils

It is interesting to compare the relative advantages and disadvantages of rubber balls and solid "go devils."

1. The rubber ball is lighter and less expensive than the solid scraper. A 22 in. rubber ball with chains weighs less than 35 pounds; a solid scraper for a 22 in. line weighs about 800 lbs. The scraper's heavy weight makes it necessary to have much more elaborate catching devices at the end of the run, whereas the catching device for the rubber ball may be quite simple.

2. Since the solid scraper is made of steel, it is probably more rugged and durable than the rubber ball. The heavy weight of the scraper makes it superior to the rubber ball from the standpoint of scouring ability. By using hard faced scraper blades, it is possible to shear off quite large projections and heavy incrustations of scale. The rubber ball and chain will remove coatings of rust or will break off small projections or extremely hard scale from steel pipe lines. The rubber ball may become punctured or torn if it engages very sharp projections within the pipe line such as are encountered where the line has been repaired by steel pins or Baker Plugs. Punctured balls are readily repaired by the patching or vulcanizing process used for repairing automobile tubes.

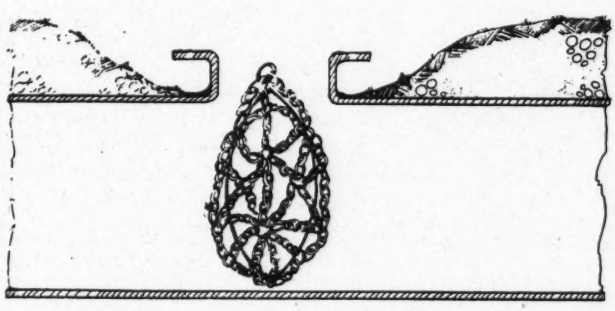
3. A stuck "go devil" or scraper can only be removed by digging up the line and removing a portion of the pipe. On the other hand, if a rubber ball becomes stuck in the line, it can usually be removed by means of a second ball without the chain. Another method of removing a stuck rubber ball is to puncture it with a sharp point on the end of ordinary sewer rods introduced through a man hole or branch connection. Where a large man hole is available downstream, and the pipe is straight, the ball can be deflated by shooting it with a .22 rifle. The diameter of the rubber ball can be reduced when it is stuck by increasing the pressure in the line. An increase in line pressure causes the air within the ball to become compressed, thereby reducing its diameter. This method may be used to enable the ball to pass by a major obstruction.

Harry J. Keeling

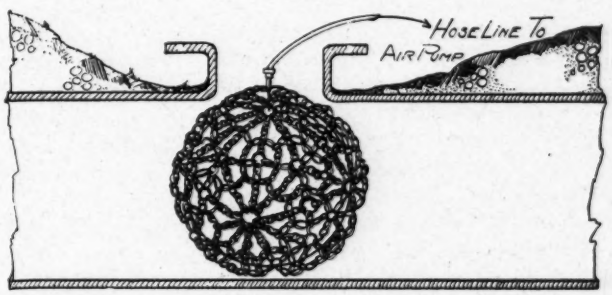
**THE CHAIN COVERED rubber ball, or Rotary Pipe Crawler, was developed and has been used principally for interior cleaning of water pipes. Its application to gas lines has not been thoroughly investigated. The tests and comparisons with other methods presented by Mr. Keeling indicate that the chain covered rubber ball has definite promise for certain gas line cleaning problems, and warrants further investigation by the industry.**

**Mr. Keeling attended the California Institute of Technology, obtaining the degree of Bachelor of Science in Engineering in 1929, and Master of Science in Mechanical Engineering in 1930. From 1930 to 1940 he was a designer for the Southern Counties Gas Co., becoming Assistant Distribution Engineer in 1940 and Mechanical Engineer in 1941. Mr. Keeling has written numerous articles for magazines and has presented many papers before the Pacific Coast Gas Association Conventions.**

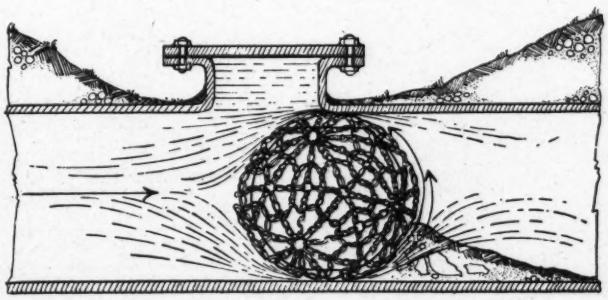
4. The rubber ball can be deflated for easy transportation or for insertion into the pipe line through small branches or man holes. On the other hand, the solid "go devil" requires more elaborate preparation because of its greater bulk and weight. It cannot be inserted into the pipe



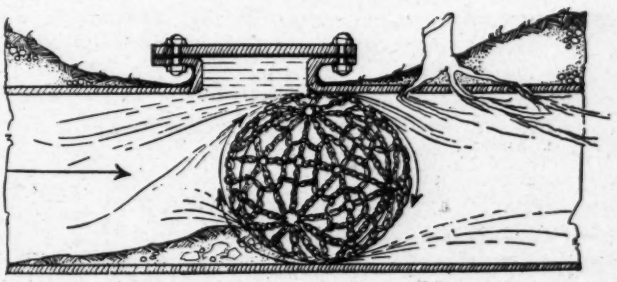
1. Deflate crawler. Insert in manhole.




2. Attach valve needle to air pump. Moisten valve needle. Insert in crawler. Inflate until fairly snug fit in pipe line.



3. Replace cover. Apply pressure. Crawler rotates as shown and chain flails bottom of pipe. Repeate with crawler inflated more.



4. After sufficient runs as above: Fill crawler with water ¾ full. Crawler then rolls on bottom, reversing its previous rotation.

Fig. 2. Method of using rotary pipe crawler in a water line.

line unless a section of pipe is removed or a special branch installed.

5. The solid scraper is usually constructed so that it will adapt itself to small variations in pipe diameter and so that it will pass around fairly smooth bends; however, it will not pass around sharp right-angled joints. On the other hand, the rubber ball, being flexible, will readily pass around right-angled miter joints, and will easily pass through greatly constricted or crushed sections which would stop the ordinary solid "go devil." The diameter of the ball, and therefore the pressure exerted on the walls of the pipe by its chain covering can be easily changed by varying the air pressure within the rubber ball, or by filling the ball with various amounts of water.

On its first exploratory trip through the pipe line, the ball can be sent through the line with reduced diameter so that there is less chance of its becoming stuck. Succeeding trips can be made with the ball blown up to a larger diameter to provide cleaning and scraping action. This feature is not possible with solid scrapers. While it is customary to construct the scrapers with means for varying the pressure of the blades on the walls of the pipe, the minimum diameter is usually fixed by the construction of the device and is not readily altered.

### Data on Steel Shavings

*Steel Shavings*: Another method commonly used for scouring the interior of gas pipe lines consists of blowing steel shavings, steel turnings or abrasive material through the line by means of the gas flow.[4] To do this, the transmission line is usually taken out of service and provisions made to discharge the dirt and dust and abrasive material into the air at a location where it will do no damage. A very high velocity flow is then created in the short section to be cleaned by rapidly opening the inlet valve, allowing high pressure gas to enter from the adjacent section. When using steel shavings, it is necessary to take precautions that they are free from bolts, nuts or heavy chunks of metal. At the high gas velocity used, such chunks become projectiles which are capable of piercing the walls of pipe at right angle turns. For this reason, some operators prefer to use some other abrasive material, such as 20 mesh blasting grit. Although this material costs a little more than the steel shavings, it does not wear out as rapidly as the steel turnings and there is little danger of damaging pipe walls with large chunks.

The advantages of using steel shavings or grit for cleaning pipe are:

1. The materials used are inexpensive and very little special euipment is required for the operation.

2. The shavings will pass around sharp bends or constrictions without difficulty, and there is no danger of creating a stoppage in the line.

There are at least three disadvantages to this method, however:

1. The steel shavings will not remove an extremely hard scale or projection from the interior of the pipe, since the large shearing forces available at the blades of a "go-devil" are not present when shavings are used.

2. When a "go-devil" or ball is used, a comparatively small flow of gas in the line will produce an extremely high gas velocity in the annular space between the cleaner and the pipe walls, because of the restricted cross section area at that point.

This high gas velocity produces a vigorous scrubbing action on the pipe surface. To obtain the same gas velocity along the pipe surface with shavings requires a much higher rate of flow through the line. This point becomes important (a) where the volume of gas available for cleaning is restricted, or (b) where the cost of the gas discharged is a factor, or (c) where the volume of gas blown from the stack must be held to a minimum because of the hazard to traffic.

3. In built-up areas, it is sometimes difficult to find a suitable location where the dirt, steel shavings, and gas may be safely discharged into the atmosphere. A large open area is required because the dirt and shavings may cause damage to buildings or crops.

### Tests on 16 in. Gas Line with Rubber Ball

After considering the merits of the several cleaning methods available, it was decided to make comparative tests on a 9000 ft. section of the 16 in. pipe line using both the chain covered rubber ball and steel shavings.

The piping arrangement shown in Fig. 3 was used to introduce the rubber ball or steel shavings into the line at the upstream end of the section. Fig. 4 shows the blowoff stack and arrangement of equipment for recovering the rubber ball. The 1 in. coupling was installed on the pipe so that it could be determined when the ball was caught by the 16 in. welding cap. In order to determine the improvement in friction factor through the test section, arrangements were made for flow tests by installing pressure measuring equipment at several points along the line with an orifice meter at the upstream end to meter the gas flow. (See Fig. 3) The 8 in. gate valve in the upstream end of the test section was included in the setup to prevent excessive wear on the 16 in. main line plug valve due to throttling high velocity gas.

The special sections were fabricated prior to the test, so that they could be inserted in the transmission line by means of couplings and a single weld with only a short period of shut down. In between test runs, the blowoff valve (Fig. 4) was closed and the line was operated at reduced capacity through the 8 in. gate valve and orifice meter (Fig. 3) and the 6 in. line valve (Fig. 4).

Referring to Fig. 3, the rubber ball was inserted into the line by closing the 16 in. plug valve, and removing the small section of pipe be-

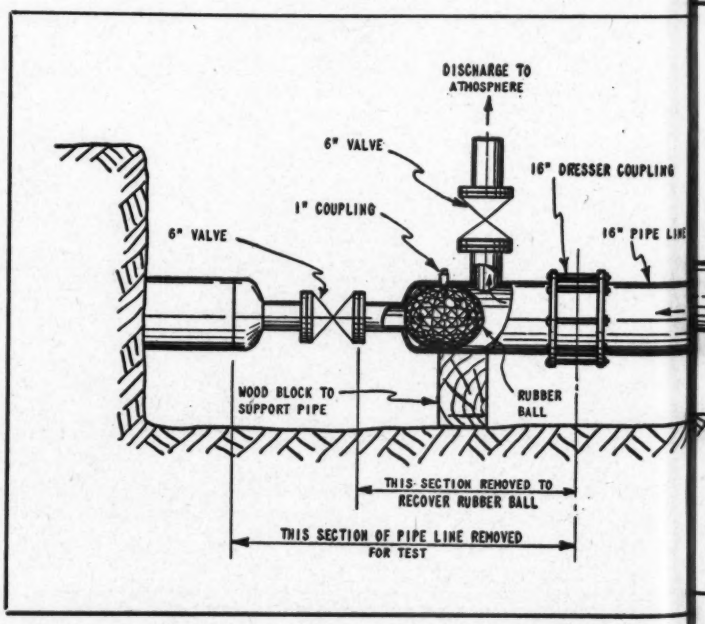



**Fig. 3**
**(Opposite page)**
**Upstream end of test section showing orifice meter and pipe arrangement for introducing the rubber ball.**

**Fig. 4.**
**(Right)**
**Downstream end of test section showing arrangement of equipment for recovering rubber ball.**

tween the 8 in. gate valve and the 16 in. Dresser coupling. The ball was then inflated until it fitted the inside of the pipe snugly. After replacing the removable section of the line, the 16 in. plug valve was opened to place pressure on the orifice meter.

The 8 in. gate valve was then cracked, building up the pressure in the test section slowly until the ball started to move. The first ball traveled through the 9000 ft. section at the rate of about 9 miles per hour. The pressure on the upstream side of the ball was approximately 2 psi., and the rate of gas flow varied from 141 Mcf at the beginning to 209 Mcf when the ball was nearing the end of the run.

### Observation Stations

Two pressure observing stations were installed on the test section, one at a point 1000 ft. from the downstream end and the other, 100 ft. from the upstream end. Radiotelephone equipment was used to keep contact between the observers working at different locations on the line. As the ball passed the observation stations, it could be heard by the rushing sound produced by the high velocity gas passing across the surface of the pipe where the ball was in contact.

For the second run, the ball was inflated to a higher pressure, so that it would scrape more thoroughly. It started to move at an upstream pressure of about 3 psi and required 7 minutes to traverse the 9000 ft. section. This is an average speed of about 14½ miles per hour. While the ball was passing through the pipe, a cloud of dirt and dust and liquid came out of the stack with the discharged gas. When the ball arrived at the downstream end, it was found to be covered with a coating of mud and dirt, and the chains showed signs of abrasion.

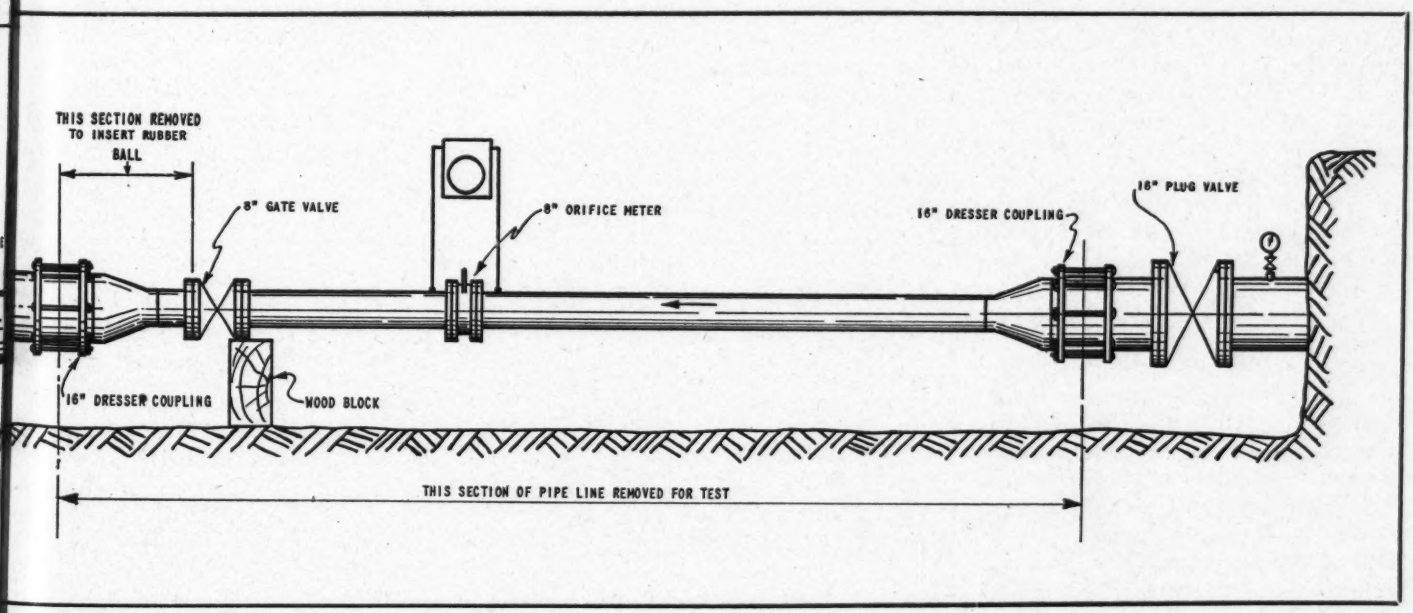
The next ball that was sent through was half filled with water to give it additional weight and also to determine if its cleaning action would be increased. However, apparently something went wrong, for the ball failed to appear at the downstream end of the test section, even though the gas volume was increased to 550 Mcf. It was concluded that the ball had become punctured and had dropped down to the bottom of the line, and the chains were caught on a projection. Therefore, a second ball was inserted, which traveled through the line at an average speed of 17 miles per hour under a pressure of 3½ psi and gas flow of 225 Mcf. This ball was passed through the section several times without finding any sign of the first ball that was lost, and on each successive trip, the ball was inflated to a larger diameter which correspondingly increased the upstream propelling pressure required.

Finally, on the last run, it was found necessary to build up the pressure behind the ball to 4 psi before it would start to move, and when it did start to move it traveled with remarkable speed. The 9000 ft. section was traversed in 4 minutes, which corresponds to a velocity of 25½ miles per hour. At the end of this trip the chains were so hot, as a result of the friction, that they could not be touched; however, the rubber showed no apparent damage. This last run brought the original ball and chain covering along with it. The original ball had a 3 in. tear in the rubber, but was otherwise undamaged. It still is not known why it was possible to pass the second ball through the line so many times without picking up the first ball.

Before the actual trials, there was some apprehension that the rubber ball would be damaged or burnt up by frictional heat in the dry gas line, since the pipe crawlers had been primarily designed for use in water lines where they would be kept cooled by the flowing liquid. The tests, and subsequent experience by others have served to dispel this theory completely. The tests also demonstrated that it was possible to control the speed of the ball fairly well by varying the pressure to which it was inflated. From the amount of dirt and rust that came out of the stack, it was concluded that the chains did a pretty good job of loosening up rust and sludge in the pipe.

### Tests with Steel Shavings

After completing the tests with the pipe crawlers, the same section of pipe was cleaned by inserting 3 or 4 cu. ft. of coarse steel lathe turnings in the line through the removable section shown in Fig. 3. These shavings were blown through the line by opening up the 8 in. gate valve rapidly. This was repeated several times, using gas flows in excess of 1500 Mcf. The shavings and rust were blown out of the stack at the downstream end of the section in a large black cloud. Close examination of the steel shavings disclosed that they were covered with dark gray mud. The cloud of dirt blown out of the line with the shavings was much greater than when the rubber ball was passed through. One reason for this may be the fact that a much larger volume of gas was discharged when the shavings were used.


THIS SECTION REMOVED TO INSERT RUBBER BALL
8" GATE VALVE
8" ORIFICE METER
16" DRESSER COUPLING
16" PLUG VALVE
16" DRESSER COUPLING
WOOD BLOCK
THIS SECTION OF PIPE LINE REMOVED FOR TEST

### Conclusions

There was quite a variation in the opinions of the several observers to these tests as to the relative efficiency of the shavings and the rubber ball as cleaning devices. Unfortunately, an atempt to measure the relative efficiency of the two methods through use of flow tests was not satisfactory. Flow tests were made on the test section prior to the test, after the balls had been passed through several times, and after the shavings had been passed through. When the results of these flow tests were computed, it was found that the data led to inconsistent conclusions and therefore could not be relied upon as a means for evaluating the merits of the two cleaning methods. It was not possible to devote any more time to the experimental work, since the transmission pipe line was urgently needed.

Inasmuch as time was so short, it was decided to clean the remainder of the 10-mile section of pipe line with steel shavings, since this process would require a minimum time, and there were plenty of suitable locations to discharge the shavings without the possibility of damage to private property. This operation was completed without unusual incident, and subsequent flow tests disclosed that the friction factor in the section had been definitely improved.

It is the writer's opinion that, as far as steel gas pipe lines are concerned, the chain covered rubber ball has a definite application in those cases where the gas and dirt must be blown to atmosphere in crowded urban areas where there is a possibility of damage to crops, buildings, or other private property. Under these circumstances, the apparent advantage of the steel shavings method is materially lessened by the increased area affected by the dirt and debris as a result of the greater volume of gas required for the operation. It is unfortunate that the advent of the war interrupted pipe cleaning research programs in most gas companies. When these are resumed, it would be well for gas pipe line operators to include the chain covered ball in future tests so that the gas industry will gain more specific data on this useful device.

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2. Gas Propelled Cleaners for Scouring Pipe Lines *GAS*, Sept. 1939.
3. Internal Cleaning of Natural Gas Pipe Lines—J. D. Killough, *American Gas Association Monthly*—March 1944.
4. The Friction Factor for the Stanpac Natural Gas Line—Frank Wills, *Proceedings* Pacific Coast Gas Association Natural Gas Transmission Committee, 1934.
5. Cleaning Pipe Without Interrupting Service, *Compressed Air Magazine*, Sept. 1941.
6. Patent No. 2,049,233 (Thomas); No. 2,309,415 (More-Pearson); No. 2,258,174. (W. R. Chawner)

# Gas Company's "Carrier Current" Speeds Communication

THE El Paso Natural Gas Co. has increased the speed of its telephone service between the main office and the company's Jal compressor station by the installation of an additional circuit that connects the Bassett Tower operator directly with the Jal operator.

By the use of "Carrier Current" equipment, it is possible to provide a second communication channel without the addition of a single foot of wire line between the two points, and as the City Gate and Jal are approximately 200 miles apart, a second wire line would have required 53,000 lbs. of copper, which is quite an item at the current price.

The use of a conductor, or a pair of conductors, as a guide or carrier of high frequency currents is not new, but its wide application in recent years has brought it to the attention of the general public.

Some of the first experimental work with "wired wireless," as it was called, was carried on as earily as 1913 by Lt. Col. George O. Squires, who became chief signal officer of the U. S. Signal Corps with the rank of Major General in October 1917.

Commercial Carrier systems wire was first used in 1918 and was made possible largely by the development of vacuum tubes as amplifiers modulators and demodulators. Another essential device developed along with the vacuum tubes was the electrical filter for selecting currents on a basis of difference in frequency.

The general method by which several conversations are carried on over a single pair of wires is as follows:

Let it be assumed that a voice frequency telephone conversation covers a band from 200 to 3000 cycles. Suppose that several voice frequency conversations are each moved "bodily" to a different higher band of frequencies and transmitted to the distant end of the line. Now suppose that at the distant end, the different bands are separated and each is lowered to its original frequency of from 200 to 3000 cycles. Then, several conversations could be carried on over one pair of live wires.

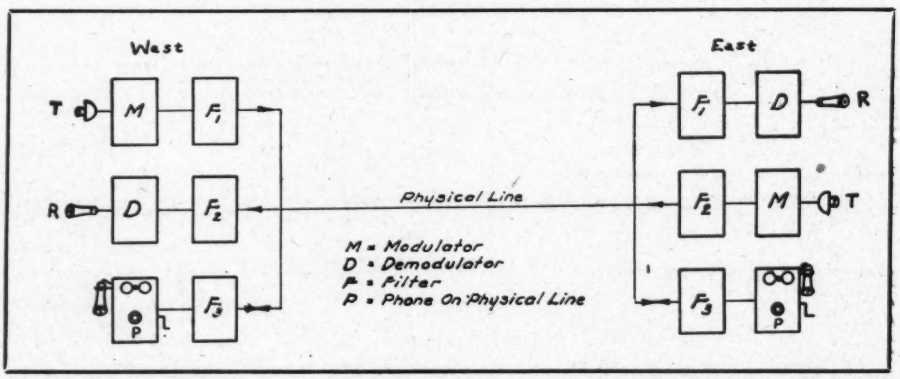
The principle of a single channel carrier telephone system operated in connection with the original physical circuit is shown in the simple block diagrams, Fig. 1.

When the transmitter T of the west station is spoken into, the voice frequency currents generated are raised by the modulator M to a much higher frequency and pass through the filter F, which is designed so that only that particular frequency will pass through filter F to demodulator D, where it is lowered to its original frequency and passes on to the receiver R.

When transmitter T at the east end is spoken into, the same thing takes place except that the frequency to which the voice frequency currents are raised is slightly different from the west end. These currents will only pass through filters F-2 to demodulator D and receiver R.

Filters F-3 at the east and west ends of the circuit are so designed that they will pass voice frequency currents from the regular telephone instruments, but will not pass the higher frequency currents from the carrier equipment.

This arrangement of filters makes it possible to separate completely the east and west carrier channels from each other and the regular telephone currents from both carrier channels.



# ASSOCIATIONS

## PCGA Plans September Convention

THE American Gas Association and GAMA will share the floor with the Pacific Coast Gas Association when PCGA holds its 53d annual convention in San Francisco, Sept. 10-12. The national situation in the promotion of New Freedom Gas Kitchens, domestic gas cooking, and CP ranges will compete with such items of chiefly Western interest as the Texas-to-California pipe line and California natural gas reserves for the attention of members at the three-day meeting.

The first day and a half will be devoted to an exposition of A.G.A. research and promotion, with Leigh Whitelaw and Harold Massey of GAMA and R. H. Hargrove, first vice president and presidential nominee of A.G.A., on the program. H. Vinton Potter, director of the New Freedom Gas Kitchen program, will be featured at the Tuesday afternoon session, and on Wednesday morning, Sept. 11, domestic gas cooking promotion will be the discussion topic.

A demonstration of the Servel-sponsored kitchen, one of the outstanding examples of the New Freedom models, will be led by R. J. Canniff, promotion manager for Servel. CP range news will be recounted by Carl Sorby, vice president of the George D. Roper Corp. and chairman of the CP Range Manufacturers group.

### "The Miracle Flame"

Attention will swing to the Pacific Coast picture at the Wednesday afternoon gathering. R. R. Gros, chairman of the PCGA advertising committee, will introduce "The Miracle Flame," a new sound motion picture in color developed jointly by the advertising committee and the sales training committee of the Sales and Advertising Section, in its initial showing.

The economic and technical features of the Texas pipe line will be told by A. F. Bridge, vice president and general manager of the Southern Counties Gas Co., Los Angeles. Roy Wehe, assistant director of public utilities of the California Railroad Commission, will discuss natural gas reserves.

A Home Service Breakfast and afternoon roundtable are also scheduled for Wednesday.

Employer-employee relations, chief topic at the Thursday morning meeting, will spotlight a demonstration of some of the basic principles of successful relations by Judge Irvin Stalmaster, prominent industrial relations consultant, and assistants.

### Section Meetings

Following a luncheon meeting of Women's Committee representatives from various companies, the afternoon will be turned over to the Accounting, Sales, and Technical sections. Tentatively planned as highlights of the technical meet are three papers: "Economical Mechanized Operation for a Widespread Gas Area," by J. E. C. Currens, Pacific Gas & Electric Co.; "Something New on Floors," by J. T. Courtelyou, Southern California Gas Co., and "Installation Standards for Plastic Pipe," author not announced.

The accent will be on social events in the convention windup, with the annual banquet set for Thursday evening and the open golf tournament Friday.

**CALENDAR**

**September**

**Sixth Annual Appalachian Gas Measurement Short Course**—West Virginia University, Morgantown, W. Va., Sept. 9-11.

**Pacific Coast Gas Association Convention**—Fairmont Hotel, San Francisco, Sept. 10-12.

**Midwest Industrial Gas Council**—Radisson Hotel, Minneapolis, Minn., Sept. 12-13.

**Association of National Advertisers**—Atlantic City, Sept. 30-Oct. 2.

**October**

**American Gas Association Annual Convention and Exhibit**—Atlantic City, N. J., Oct. 7-11.

**34th National Safety Congress and Exposition**—Stevens Hotel, Chicago, Oct. 7-11.

**November**

**National Hotel Exposition**—Grand Central Palace, New York City, Nov. 11-15.

**National Metal Congress and Exposition**—Atlantic City, Nov. 18-22.

**December**

**National Exposition of Power and Mechanical Engineering**, Grand Central Palace, N. Y., Dec. 2-6.

**March, 1947**

**New England Gas Association Annual Convention**—Boston, March 20-21.

## Hargrove Heads Slate of Candidates for Election at A.G.A. Meeting in October

VICE PRESIDENT R. H. Hargrove, of the United Gas Pipeline Co., Shreveport, La., nominated for the office of A.G.A. president, heads the slate of nominees selected by the nominating committee for consideration at the 28th annual convention of the American Gas Association, to be held in Atlantic City ,N. J., the week of October 7.

R. H. Hargrove

Hargrove is incumbent first vice president.

Other prospective officers listed in the panel released last month by Committee Chairman Elmer T. Schmidt, vice president of the Lone Star Gas Co., Dallas, Texas, included:

*First vice president:* Hudson W. Reed, president, The Philadelphia Gas Works, Philadelphia, Pa., incumbent second vice president of A.G.A. and chairman of the Manufactured Gas Department.

*Second vice president:* Robert W. Hendee, president of the Colorado Interstate Gas Co., Colorado Springs.

*Treasurer:* Edward F. Barrett, president, Long Island Lighting Co., Mineola, N. Y., incumbent in the office.

*Directors,* for two-year terms: F. M. Banks, vice president, Southern California Gas Co., Los Angeles; R. G. Barnett, vice president and general manager, Portland (Ore.) Gas & Coke Co.; A. M. Beebee, vice president, Rochester Gas & Electric Corp., Rochester, N. Y.; James A. Brown, vice president, Commonwealth and Southern Corp., New York; D. P. Hartson, vice president, Equitable Gas Co., Pittsburgh, Pa.; Lyle C. Harvey, president, Bryant Heater Co., Cleveland, Ohio (nominated by GAMA); John C. Parker, vice president, Consolidated Edison Co. of New York; George F. Mitchell, president, The Peoples Gas Light & Coke Co., Chicago, Ill.; D. P. O'Keefe, president, O'Keefe & Merritt Co., Los Angeles, Calif. (nominated by GAMA); Frank C. Smith, president, Houston Natural Gas Corp., Houston, Texas; A. H. Stack, president, The Tampa Gas Co., Tampa, Fla.

Section nominees to be considered are listed below:

### Accounting Section

Chairman: L. V. Watkins, Panhandle Eastern Pipe Line Co., New York.

Vice chairman: John A. Williams, Niagara Hudson Power Corp., Syracuse, N. Y.

### Industrial and Commercial Gas Section

Chairman: Karl Emmerling, The East Ohio Gas Co., Cleveland, Ohio.

Vice chairman: Leon Ourusoff, Washington Gas Light Co., Washington, D. C.

### Manufacturers Section

Chairman: Alan Tappan, president, Tappan Stove Co., Mansfield, Ohio.

### Residential Gas Section

Chairman: Wallace M. Chamberlain, Michigan Consolidated Gas Co., Grand Rapids, Mich.

Vice chairman: C. S. Stackpole, Consolidated Gas Electric Light and Power Co. of Baltimore, Md.

### Technical Section

Chairman: C. S. Goldsmith, Brooklyn Union Gas Co., Brooklyn, New York.

Vice chairman: A. C. Cherry, Cincinnati Gas & Electric Co., Cincinnati, Ohio.

### Publicity and Advertising Committee

Chairman: E. M. Tharp, Ohio Fuel Gas Co., Columbus, Ohio.

### Other Committees at Work

Other committees are also at work on the job of accommodating, informing, and entertaining the anticipated 10,000 attendants at the convention.

Interest on the part of manufacturers in the exhibit of gas appliances and equipment to be staged by GAMA at the Atlantic City Auditorium is evidenced by the large volume of reservations for floor space which had been made through July 1. The show is expected to be the largest as well as the best ever presented by the gas industry.

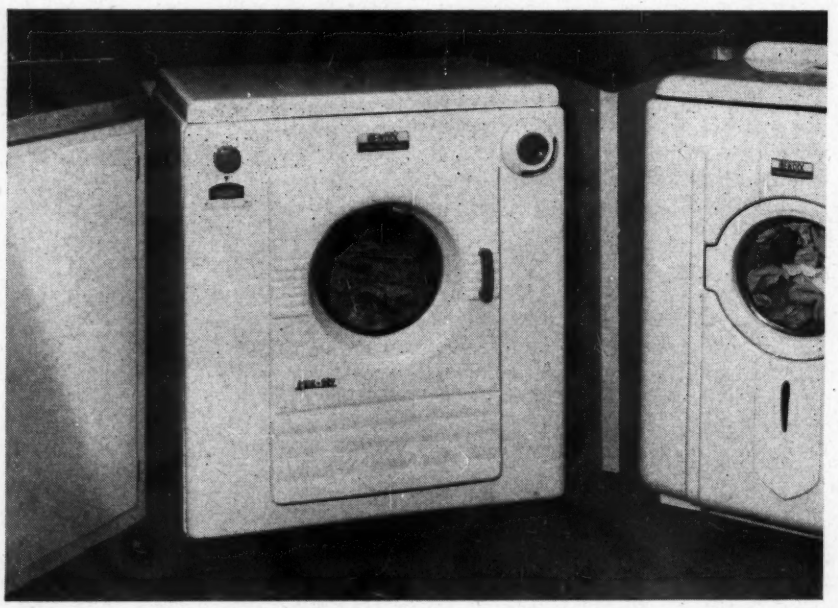
Included in program plans are: the Monday morning meeting of the Manufactured Gas Department at the Traymore Hotel, and of the Natural Gas Department at the Claridge; general sessions Tuesday and Thursday mornings, with an entertainment program Wednesday evening; Tuesday and Thursday morning meetings of the Industrial and Commercial Gas Section at the Traymore; meetings of the Residential Gas Section in the auditorium on Wednesday morning and Thursday afternoon; Home Service breakfast on Wednesday at the Traymore, and round table at the Claridge Tuesday afternoon; Accounting Section general session on Tuesday afternoon, with general accounting and customer accounting sessions Wednesday morning at the Ritz-Carleton; three sessions of the technical section at the Ambassador, Tuesday afternoon, Wednesday morning, and Thursday afternoon.

## Clothes Dryer Fired With Gas

BENDIX Home Appliances, Inc., is building a gas-fired clothes dryer which will be on the market late this summer. The dryer, fully automatic, is the companion piece to the established Home Laundry, and is timed to keep pace with the washing operation.

Drying in the new appliance requires 45 minutes for 18 lb. of wet clothes. A patented criss-cross tumbling action gives uniform drying without tangling.

Thermostatic control assures safe operation and makes for completely automatic operation, according to L. F. Worth, the company's manager of dryer sales. "All the housewife does is put the clothes into the dryer porthole, set the controls and leave. Clothes cannot be harmed, as the dryer shuts itself off when the job is done."



Among advantages claimed for the product are less lint, directed exhaust, protection against extreme heat and fading for silks, synthetics, and colored clothes. Automatic regulation determines whether clothes will be damp dry or bone dry as the housewife desires.

Specifications: capacity, nine lb. of dry clothes; drum speed, low for proper tumbling; motor, ¼ hp., 110-volt, a.c.; gas heat unit, piping capacity to handle about 20,000 Btu per hour; dimensions, 36 in. high (counter height), 31 in. wide, 26 in. deep (approximate); finish, white, high-baked enamel.

# PROMOTIONAL

## NOTES and NOTIONS

By STANLEY JENKS

### Realism

Looking at the postwar world today and comparing it with the hopped-up fantasies of our wartime dreamers, there must inevitably be a deep feeling of disappointment among the general public.

There were even those in the gas industry who felt we had to do our share of lily-gilding in our national advertising to compete for public attention. This page never did subscribe to that theory, simply because kidding Mr. & Mrs. John Q. Public never has been and never will be good business.

Today, it seems, our promotional efforts still lack the realism the situation warrants. Are we right in presenting pictures of glamorized new homes and kitchens, while we know that new home construction for a long time to come must be concentrated primarily in the low-cost brackets to take care of ex-G.I. Joe and his newly-acquired family? In fact, so long as an acute building material situation exists—and believe me, it is acute—it hardly seems patriotic to try to persuade people to renovate existing kitchens until all the new needed kitchens have been built.

It is our duty to keep our service and modern appliances constantly before the public and use every medium we possibly can to this end, but—a little more realistically, gentlemen, if you please, until the postwar world has settled down to the more peaceful way of life.

### Mass Production

Those notes of mine in the June issue, appealing for appliance simplification, especially for fewer sizes and designs of automatic storage water heaters, rang the bell with many readers, judging by the commendatory mail the item produced. Since a writer, like a utility, mostly gets complaints, and little praise, it is all very encouraging. Perhaps something will be done toward simplification, since sentiment apparently favors it in the industry.

The manufacturer of water heaters cannot be blamed for the present chaotic situation. Traditionally, he has had to appease the non-standardized whims of gas utility utilization men to survive. A personal experience when I was selling for a water heater manufacturer will illustrate the point. In one instance, to enjoy the "approval" of five gas companies operating within a radius of 20 miles, we were obliged to stock in a commercial warehouse five variations of the same basic water heater. Any one of these five variations would have worked equally well on any and all of the five distribution systems. The situation was none of our creating. We had to meet competition. Apart from the increased manufacturing expense through departure from standard mass production in the factory, we had to carry unnecessarily large inventories and, all in all, assume additional costs that were certainly not reflected in increased quality in the product itself.

The United States has amply proved its case on the benefits of mass production. Why, by all that's sensible, doesn't the gas industry take advantage of it with the major appliances it must have to survive?

In other words, let's not be so damned finicky. Our manufacturers have brains too.

### New Customers

A British gas man has recently pointed out to the brethren that of 13 million housewives in Great Britain, approximately 2,750,000 (one in five) started married life since September, 1939, and in that blitzed and severely rationed country, had had practically no experience of normal housekeeping.

While we were not blitzed over here and our rationing at its worst was only mildly moderate, we must have millions of brides since 1942 who have had little opportunity or occasion to run a home along normal lines.

This group represents a very important factor in our promotional plans. What do these gals think about gas service? Are they alert to its advantages and anxious to enjoy it? Have they wartime savings available to get it? It is assumed that most of them are anxious to set up homes of their own, as evidenced by the terrific demand for new low-cost residence construction. Will they insist that no new home will be complete for them unless they have gas for cooking, water-heating, and refrigeration, at least as a starter?

They and their needs are worth an awful lot of study by the local gas promotional lads, for they are the best kind of long-time customers, once they are "sold."

### So It Goes

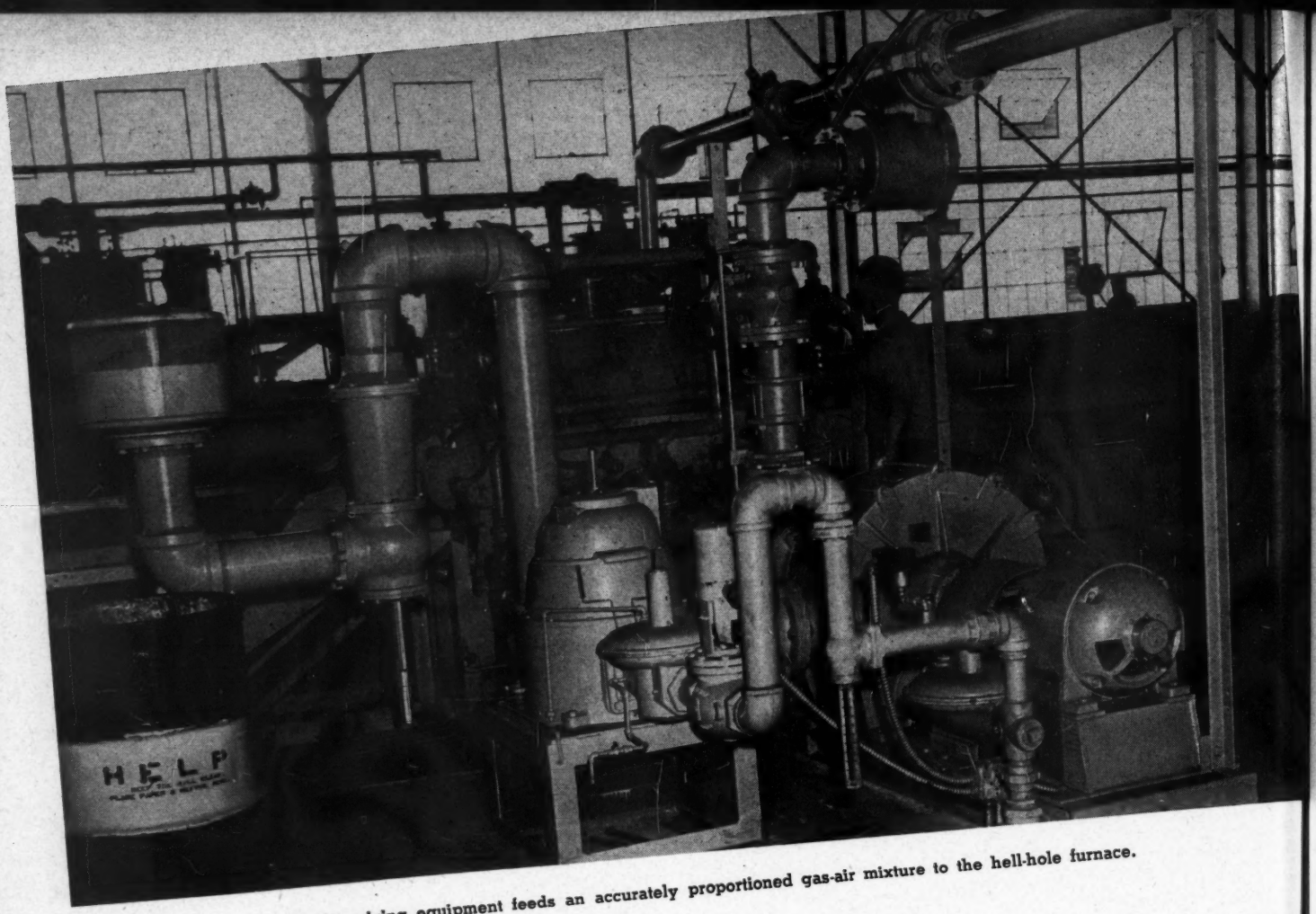
A colleague asked me, of all people, the other day if I could help him get a new electric range.

It was like old times finding somebody I could really go to work on selling the advantages of gas for cooking. The top burners were more flexible, the thermostatically-controlled oven gave a more even heat for baking, the kitchen was just as cool, and the initial cost considerably less. I know he was impressed, but I sensed I wasn't getting very far.

"What ever prompted you to think of anything but a modern gas range?" I asked him.

"Well," he said, "I don't know a thing about it. It's the maid. You know how things are. She says she has to have an electric range, and that's that."

Yes indeed! That's that, these days. The "battle of the fuels" has to be fought at all levels.




Gas-air mixing equipment feeds an accurately proportioned gas-air mixture to the hell-hole furnace.

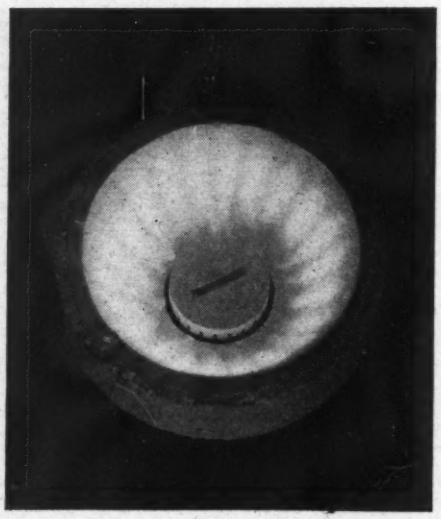
# THE "HELL-HOLE"

By W. S. COLMERY,

Chief Metallurgist, Pacific Tube Co., Los Angeles

PACIFIC Tube Co., Los Angeles, has installed a "hell-hole" gas-fired, production line furnace for the continuous heat of stainless steel.

The hell-hole is another first to add to Pacific Tube's growing list of achievements, which began when the company built the first steel tube mill in the west in early 1943. Within 90 days, it was ready to start production of tubes.



Specially designed, all-ceramic burner, which withstands temperatures up to 3100 F. Four banks of seven burners each are used in the hell-hole.

Speed and efficiency are always the watchwords at Pacific Tube. All of the plant's wartime resources are now aimed at the West's biggest peacetime job — reconversion. The company's engineers, metallurgists and technicians, armed with the "know-how", and backed up with the most modern equipment obtainable, bring western industries a practical solution to many heretofore tough bending, welding and shaping procedures. Installation of the new "hell-hole" furnace at Pacific Tube is another example of the plant's effort to improve its products and processes.

### General Construction

This "hell-hole", used for heat treating stainless steel, looks more like a machine tool than a conventional furnace. Its installation automatically eliminated the need for an isolated heat treat department.

Because of the revolutionary construction and design features, this equipment—or *tool*—can be manipulated so that heat can be applied when, where, how and to the exact degree needed, and this work is done on a

# AT PACIFIC TUBE

continuous, production-line basis at mill speeds. This furnace consists of three main components:

1. Gas combustion controller.
2. The furnace itself, containing the burner assemblies.
3. Intake and outlet variable speed conveyors.

Overall length of the "hell-hole," including the conveyors, is 58 feet and it is approximately 4½ feet in width at the widest point.

### Gas Combustion Controller

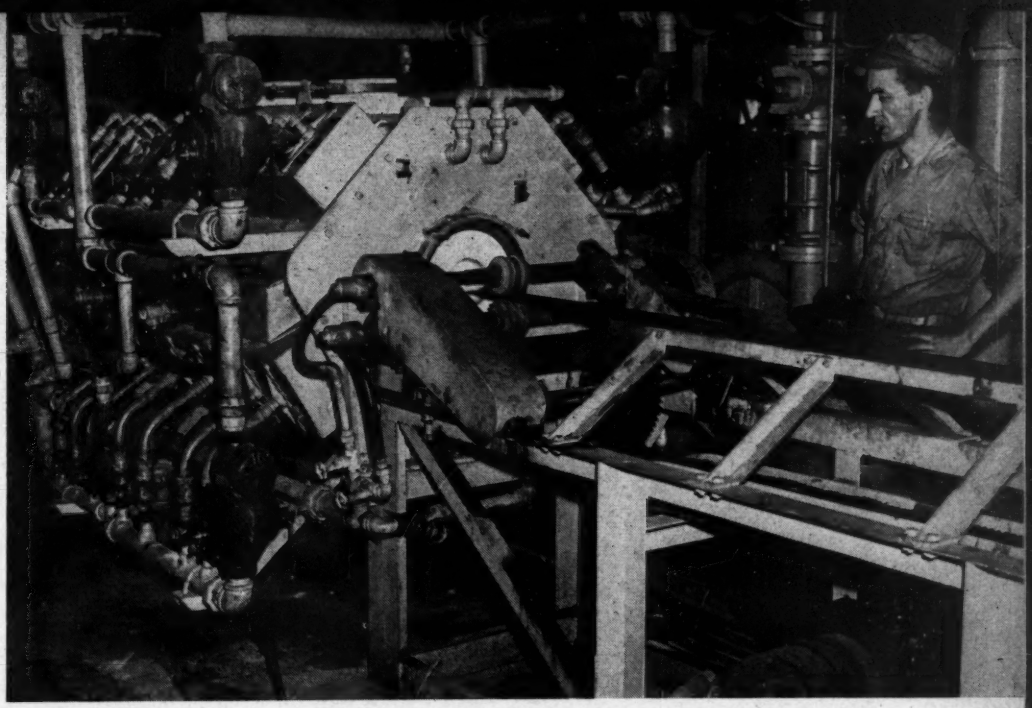
Accurate control of gas combustion is necessary to assure maximum efficiency of this furnace. In order to burn properly, gas must be mixed with a definite air ratio. The combustion controller takes air from the atmosphere and gas directly from the main, through proportioning valves that are adjusted to give a perfect gas-air ratio. A compressor then boosts up the pressure of this mixture and delivers it to the furnace burners.

### The "Hell-Hole" Furnace

The furnace itself is a compact, precision-built unit, containing four banks of seven burners each (28 burners in all), individually controlled. Since temperatures up to 3100° F can be achieved, it is obvious that any ordinary metal burner would be fused or melted under these extreme temperatures. Specially designed, all-ceramic burners, capable of withstanding such intensified combustion, furnish the necessary radiant heat energy. These ceramic burners make possible the use of the carbureted gas-air-mixture at higher than normal temperatures.

### Large Heat Releases

With these burners it is possible to get large heat releases in small burner concavities, by utilizing the insulating and refractory qualities of ceramics to get complete combustion reaction within the burner itself. These ceramic burners, when heated to incandescence, give off even, blast-free, radiant heat. Pinch roll guides are affixed to both the entrance and exit openings and two doughnut ring sprays at the end of the furnace are used for quenching.



Work entering the gas-fired, hell-hole furnace at Pacific Tube Co.

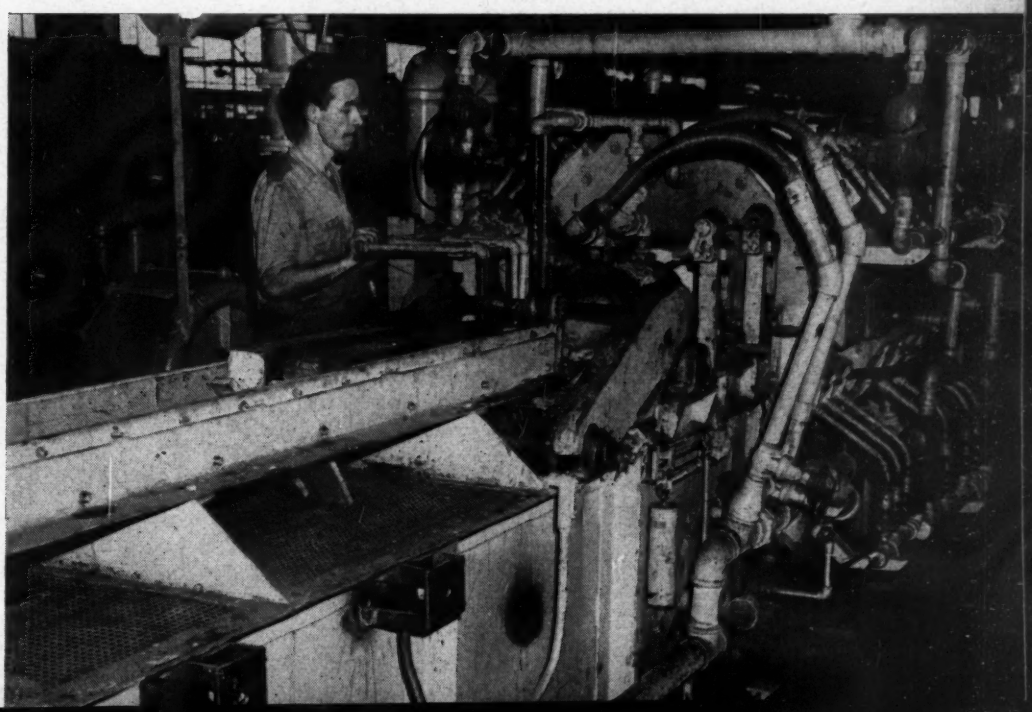
There are several advantages of this gasfired, production-line, heat-treating furnace. The saving in floor space for the furnace alone is considerable and, since quenching is done "on the fly," it is not necessary to have special quenching baths. Because work is handled on a continuous, production-line basis, it is not necessary to set up an isolated heat-treat department and efficient routing of production is thereby expedited. The rate of heat transfer in this gasfired, "hell-hole" is so fast that the actual time of metal under heat has been lessened considerably, thus minimizing scaling, decarburization, etc.

Considerable tonnage of stock (up to 1000 lb. per hour) can be handled in single line transit and the same exact temperatures are applied to each length of stock.

### Pacific Tube Future

Pacific Tube is now a strong and unique western resource, here to stay, to help in speedy and practical reconversion. The company has set up a consumer service engineering department, which is on call to any western manufacturer seeking advice or information about the process developed by Pacific Tube which will enable manufacturers to cut fabricating or processing costs.

A double ring doughnut spray quenches work as it emerges from the gas-fired hell-hole furnace.



# *Sales Pointers* . . . on New GAS Appliances

## Hardwick Model 186 Gas Range

*Manufacturer:* Hardwick Stove Co., Cleveland, Tenn.

Dealers and salesmen merchandising gas appliances must first, of course, sell the customer on the fuel. This accomplished, the customer must be shown what Range A, for example, has to offer that other gas ranges do not.

Range A here is the Hardwick Model 186. In designing it, the manufacturer has concentrated on giving the buying public a range engineered for all types of gases, which combines five general advantages: the utmost in uniform, fast cooking performance; ease of cleaning; functional and yet beautiful design, and sturdy construction; popular price, and added convenience features.

**MODEL 186 RANGE**
**Measurements**

| | |
|---|---|
| Width | 36 in. |
| Depth | 23⅜ in. |
| Height to cooking top | 36 in. |
| Height, overall | 41 in. |
| Floor space | 36 in. x 23⅜ in. |
| Oven | 18 in. wide x 19 in. deep x 14¼ in. high |
| Gas connection size | ¾ in. pipe |
| Top burners | 2 standard, 2 giant |
| Shipping weight (approx.) | 247 lbs. |

**1.** *Cooking performance* is assured by careful engineering and testing in the Hardwick laboratories, which are among the largest and best equipped in the nation. Extra generous Fiberglass insulation of the blanket type gives maximum efficiency. Equalized heat distribution in the oven has been demonstrated. Cakes placed anywhere inside the spacious compartment show no appreciable variation in brownness, either from front to back or top to bottom. The oven burner is of the high speed, low temperature type, and is automatically controlled. The one-piece oven holds a 30-lb. roaster with ease.

**2.** *Ease of cleaning.* Second only to cooking performance is the stress laid upon the extra features which make the range easy to clean and to keep clean. The corners are smoothly rounded, and there are few projections and crevices to complicate the cleaning job. The smokeless, roller bearing broiler is removable for easy, quick cleaning. Wall streaks are prevented by the placement of the vent in front, which dissipates vapors into the air. With the top and backguard constructed as one piece, a dirt-catching joint is eliminated. The recessed toe base of black lacquer conceals toe marks.

**3.** *Functional but beautiful design* is incorporated in the simple, flush-to-wall, down-to-floor lines, which will remain stylish for years. Finish is of top-grade porcelain enamel. Sturdy construction is assured through the use of the best materials.

**4.** *Popular price.* One of the major selling points is the low price, which the manufacturer estimates to be within the budget of 80% of the prospective new range purchasers.

**5.** *Convenience.* The top is divided, with two Efflex burners on each side. Two of these are giant-size, and two standard; they are efficient, fast and flexible. A flick of a finger will give a gentle simmer or a thumping boil. These specially-designed burners operate with equal efficiency using any type of gas. Added convenience is embodied in the two warmed compartments on either side of the oven, which heat platters and plates, and keep cereals and crackers crisp.

**SPECIAL FEATURES**

1. Front vent prevents wall streaks. Vapors vanish into air.
2. Efflex burners, designed for all gases. Two giant, two of standard size.
3. Divided top.
4. Automatic oven heat control.
5. Smokeless roller bearing broiler, removable for easy cleaning.
6. Warmed compartments.

# *What makes the Smiths like* **GAS?**

LIKE all families who use American-Standard Gas Fired Equipment, the Smiths are sold on gas . . . and they don't hesitate to tell their friends.

Of course, they like gas because it is clean, convenient, economical. *But good equipment makes a good fuel even better!* And all over the country thousands of "Smiths" are finding American-Standard Heating Equipment to be the ideal way of converting gas into comfortable, care-free living.

For example, here's a 3-way combination that makes it possible for your customers to enjoy gas heating at its best. The "Empire" Gas Boiler, used with recessed "Sunrad" Radiators, brings to smaller homes the convenience and healthful comfort of fully automatic gas fired radiant heat, combined with a beauty that adds to pride of ownership. And the efficient "Budget" Water Heater assures a plentiful supply of hot water at low cost.

You can widen the acceptance of gas in your area—increase your load and create satisfied customers — by recommending American-Standard Gas Fired Heating Equipment. **American Radiator & Standard Sanitary Corporation,** P. O. Box 1226, Pittsburgh 30, Pa.

**EMPIRE GAS BOILER**
With patented pin-type cast iron heat absorbing section. Efficient with either natural or artificial gas.

**BUDGET GAS FIRED AUTOMATIC STORAGE WATER HEATER**
With spiral flue baffle to give maximum heat transfer.

**SUNRAD RECESSED RADIATOR**
Compactly designed, with smart, simple lines. Combines the advantages of radiant and convected heat.

**AMERICAN-Standard**
HEATING PLUMBING
*Serving the Nations' Health and Comfort*

***LOOK FOR THIS MARK OF MERIT***—It identifies the world's largest line of Heating and Plumbing Products for every use . . . including Boilers, Warm Air Furnaces, Winter Air Conditioners, Water Heaters, for all fuels . . . Radiators, Convectors, Enclosures . . . Gas and Oil Burners . . . Heating Accessories . . . Bathtubs, Water Closets, Lavatories, Kitchen Sinks, Laundry Trays, Brass Trim . . . and specialized products for Hospitals, Hotels, Schools, Ships and Railroads.

## Latest Developments in the Use of

# Gas for Firing Glass Melting Tanks

By F. G. SCHWALBE,

Toledo Engineering Co., Inc.

**GLASS MELTING is best accomplished by applying heat above the glass bath, with radiant flame characteristics so that the heat can be transmitted downward into the glass by radiation as well as absorbed at the surface, and at a uniform rate and distribution throughout the furnace. Gas fuel is therefore ideal for the purpose because of its uniformity and controlability. A system of glass furnace firing is described wherein a "control gas" mixture is introduced into the fuel gas as it enters the furnace to combine with the separately introduced combustion air. This "control gas" consists of a mixture of air and flue gases, with proportions varied as desired; as the air component is increased the flame shortens, and as the flue gas component is increased the flame lengthens; the total volume of "control gas" is never larger than the volume of fuel gas, so an explosive mixture is never developed. Presented before the A.G.A. Conference on Industrial and Commercial Gas, Toledo, March 29 and 30.**

GLASS melting requires a uniform controlled heat release. By uniform is meant a heat source whose radiation characteristics can be maintained constant at all times.

Radiation characteristics are important in glass melting because in most cases glasses will transmit radiant energy in both the solid and liquid states. Glass melting is done by application of heat to the surface of the glass bath. It is apparent, therefore, that a source of heat that can impart heat to the surface of the glass and radiant energy that can be transmitted and absorbed by the glass bath, has worth-while characteristics. How important these characteristics are and the importance of being able to maintain unformity at all times is at once apparent when we consider that glass is produced by controlled convection currents and temperature gradients within the bath.

Recent work on temperature gradients in molten glasses of various colors indicated that the lower layers of glass in many furnaces have a tendency to lie dormant. These lower dormant layers of glass may vary in composition from the upper layers. Not too much trouble will result from such dormant layers of glass provided the temperature gradient within the bath is not changed. However, it can readily be seen that should the radiating characteristics of the heating flame change, let us say from relatively low to relatively high, the surface temperature of the glass might not be affected but the temperature gradient within the glass might be decreased. A decrease in the temperature gradient or increasing the temperature of the lower dormant layers of glass will reduce their viscosity and some of this glass may enter the normal convection flow stream.

The ability of a gas flame to radiate, and glasses to transmit radiant energy is shown in Figs. 1 and 2. Fig. 1 shows the familiar Planck curve and the large concentration of radiant energy that is available from radiant carbon in the range 1 to 3 u. Fig. 2, while indicating the transmission value of various glasses in the cold state, shows that most glasses have maximum transmission values in the range from 1 to 3 u. In practice molten glass seems to have characteristics similar to those indicated in Fig. 2.

Natural gas as a glass melting fuel is ideal because it is uniform, clean and has good radiating properties that are easily controlled and maintained. Granting that a soft radiating flame is desirable for most glass melting operations, the method of firing should next be given attention. Regardless as to whether we are considering the use of a premix type of burner for day tank melting, the conventional side fired or luminous flame application of fuel on a continuous melting tank, the gas-air ratio must be maintained absolutely constant. To maintain a constant air-gas ratio means that some form of accurate metering or ratioing device be used on both the gas and the air. To maintain correct meter readings the combustion air temperature should be automatically maintained absolutely constant at all times.

Gas lends itself admirably to such control and if such control is effected the most important phase of burning gas in a glass melting furnace is satisfied. Much money has been spent to meter fuel but woefully little to meter and control the air supply.

The conventional simplest method of applying gas to a regenerative or recuperative glass melting furnace consists of introducing the gas at an angle through the port side walls. Introducing the gas directly into the preheated air stream will give satisfactory results when extreme care is taken and well designed adjusting brackets permit centering, cleaning and replacing the gas firing tips to a fixed position. This application of fuel has the dis-

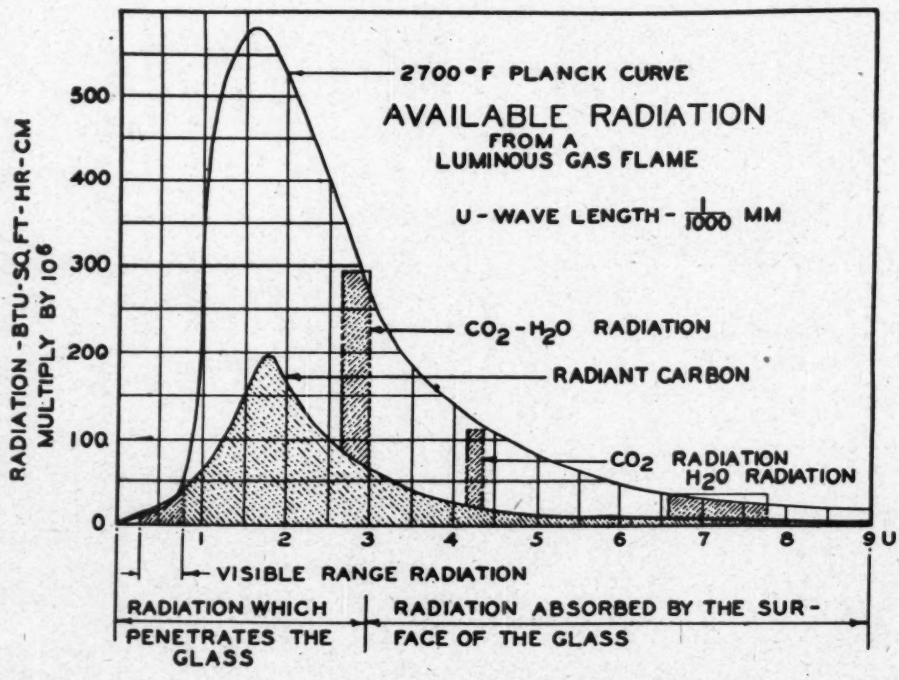



FIG. 1. Available radiation from a luminous gas flame.

Happy? Of course she's happy—and she's telling her friends why. With a new Automatic Hot Water Heater she will have plenty of hot water at all times for every purpose — dishes, laundry, cleaning, baths, etc.

Millions of homes—old and new—will be equipped with Automatic Hot Water Heaters during the next few years.

Be sure that your customers get the best possible service from their Automatic Hot Water Heaters by equipping them with

**TITAN**
**WATER HEATER CONTROLS**

*For an adequate supply of TITAN CONTROLS may we suggest that you place orders as far in advance of your requirements as possible.*

**THE TITAN VALVE & MANUFACTURING COMPANY**

9913 ELK AVENUE • CLEVELAND 8, OHIO

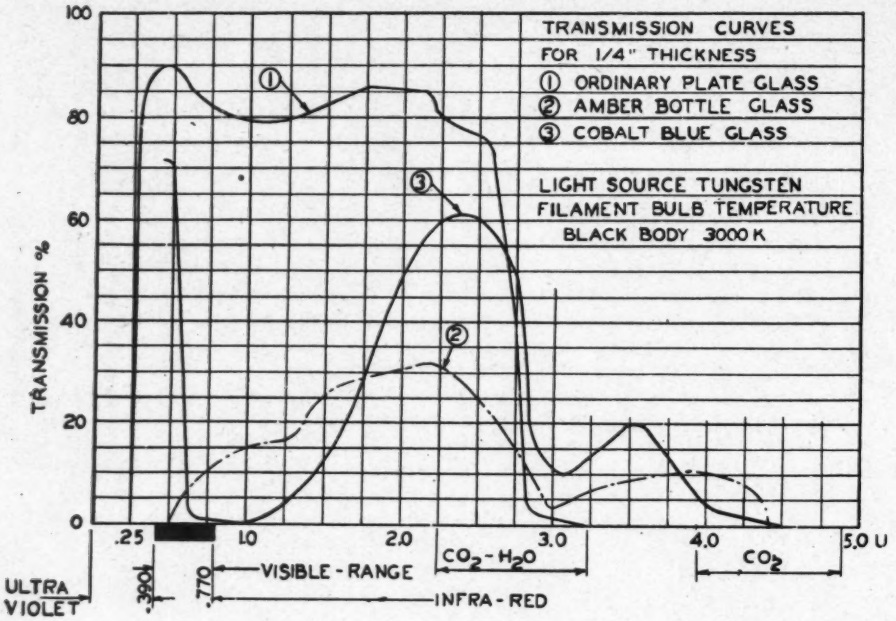



**FIG. 2. Transmission curves for 1/4 in. thickness ordinary plate glass, amber bottle gas, cobalt blue glass.**

advantage that cold air in unknown quantities is induced by the fuel gas streams. Sealed in burners eliminate this difficulty.

Low pressure firing with sealed in burner tips has been widely adopted for continuous melting furnaces. Some of these installations produce an uncontrollable soft luminous flame by introducing the fuel gas into the furnace in a manner that cracking of the hydrocarbons is effected. Such an installation is usually wasteful of fuel because the flame length is difficult to control. Luminous flame installations are available in which the flame length can easily be controlled.

Luminous flame burners are also available for direct fire operations. In order to effect the heat release desired, such burners are usually designed so that a flame of greatest radiating properties can be used consistent with obtaining the desired heat release within the furnace.

Fig. 3 shows a diagrammatic arrangement of a controlled luminous flame installation as applied to a regenerative cross fired glass melting furnace.

By the ingenious utilization of a "control" gas mixture introduced into the fuel gas before the fuel gas enters the port, the controlled luminous flame can be varied to suit the load on the tank and at the same time adjusted to just reach across the tank without burning in the outgoing checkers. This not only prevents checker burn-out, but also spreads the flame over the largest possible area of glass surface.

The composition of the "control" gas may be 100% air, 100% waste gas from the stack flue, or any needed proportion of air and waste gas. "Control" gas is furnished by a motor-operated fan whose intake is connected both to the flue and to atmosphere. The intake is also fitted with an adjustable gate by which the proportions of waste gas and air entering the fan may be changed at will.

Combustion air for the furnace is furnished by a fan and both air and gas are metered. For a given load, combustion air and fuel gas are fed to the furnace in the ratio of about 12:1, equivalent to about 15% excess air. It will usually be found that the velocity of the gas layer in the furnace is lower than the air layer velocity, so "control" air is now introduced directly into and with the fuel gas to increase the velocity of the gas layer. The amount of "control" air introduced never exceeds the gas volume and an explosive mixture is thus avoided.

When the velocities of the air and gas layers have been equalized by the use of "control" air, the flame may be too short to reach across the tank. To lengthen the flame, a part of the "control" air is replaced by inert waste gas, the proportion of waste gas being increased until the flame reaches the desired length. This flame adjustment is quick and sure and can be made at any time without affecting the total heat of the flame. An increase in the proportion of air in the "control" mixture shortens the flame; and increase in the proportion of waste gas lengthens the flame by delaying combustion. Complete combustion is always secured, however.

The conventional uncontrolled system of luminous flame firing consists in introducing the fuel gas as indicated in Fig. 3, without the use of the control gas mixture. Flame length in such an installation is difficult to control and can only be accomplished by changing the gas tip diameter or by the wasteful procedure of introducing an excess of combustion air.

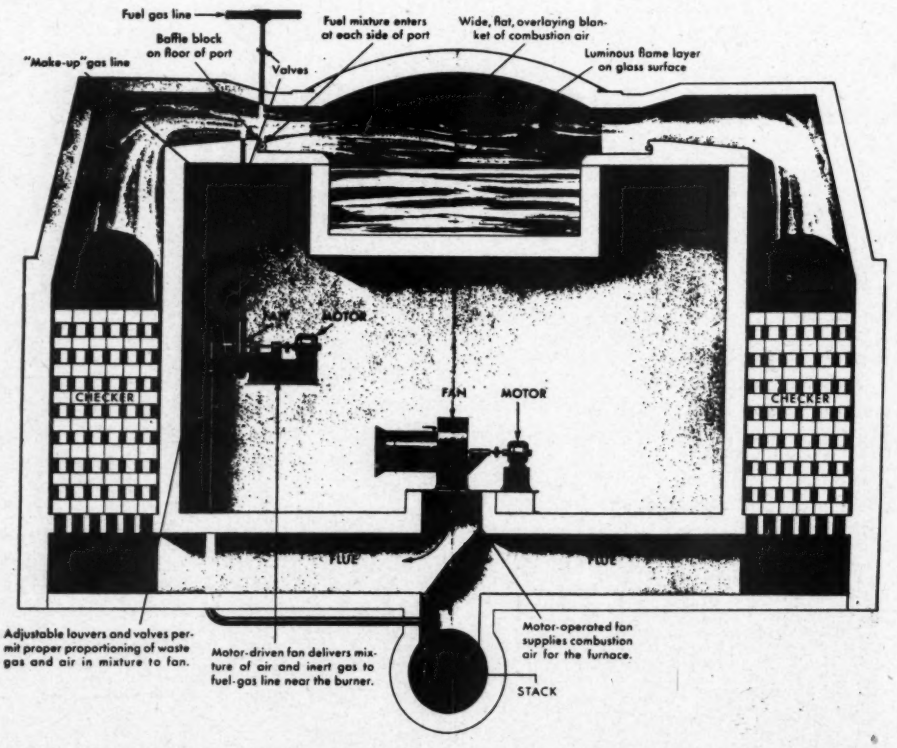

Fuel gas line
Baffle block on floor of port
"Make-up" gas line
Valves
Fuel mixture enters at each side of port
Wide, flat, overlaying blanket of combustion air
Luminous flame layer on glass surface
FAN
MOTOR
CHECKER
CHECKER
FAN
MOTOR
FLUE
FLUE
Adjustable louvers and valves permit proper proportioning of waste gas and air in mixture to fan.
Motor-driven fan delivers mixture of air and inert gas to fuel-gas line near the burner.
Motor-operated fan supplies combustion air for the furnace.
STACK

**FIG. 3. Diagram showing essential features of the controlled luminous flame system.**

# WARD *Floor Furnace Experience* GOES ALL THE WAY BACK TO 1909

The sound engineering principles embodied in the Ward Floor Furnace are a direct result of *long experience.*

Ward manufactures floor furnaces *exclusively*—and year by year has developed and improved this product, until today it is considered the standard of quality in every area where it is sold.

To the dealer—Ward *brand acceptance* and *proved principles of construction* mean less sales resistance on the part of the prospect—*virtually no service problems* once installation has been made.

For the present—shipments will continue to be made only to our long-established dealers. However, we are "stepping up" our production schedule—and are looking forward to the day when we can offer additional dealers the sales advantages of Ward Floor Furnaces.

**WARD HEATER COMPANY**

1800 W. WASHINGTON BLVD., LOS ANGELES 7, CALIFORNIA

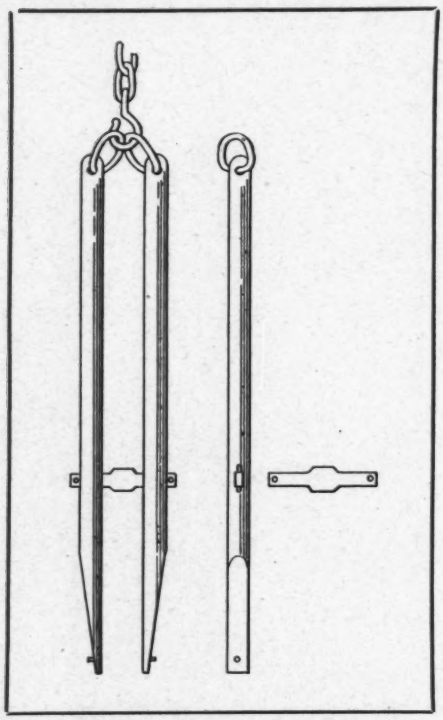
*37 YEARS OF "KNOW-HOW"*

# OPERATING IDEAS

## Device for Pulling Spark Plug Retainer

**RALPH K. WILLIS, assistant chief engineer, Centralia, Ill., compressor station, Panhandle Eastern Pipe Line Co.**

Follow these directions to construct the device for pulling spark plug retainers: take two ½-in. rods, 10 in. long and cut slot in rod 3½ in. from

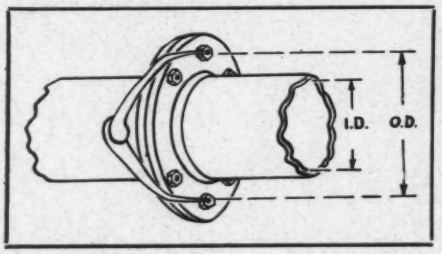


end. Put ¼-in. dowel in lower end of rod. Place ring on upper end of rod. Make bar 2 in. long and ⅜ in. high with large place in center ½ in. long. Drill cotter keyhole in each end of bar.

## Measuring For a Gasket

**SUBMITTED by W. F. Schaphorst, M.E., 45 Academy St., Newark, N.J.**

Contrary to common belief, it is not necessary to take a flange apart in order to measure for a gasket. Ac-




curate measurements may be made from the outside as indicated in the accompanying sketch. By means of a pair of calipers, take the distance from the inside of one bolt to the inside of the bolt diametrically opposite. This gives the exact outside diameter of the gasket.

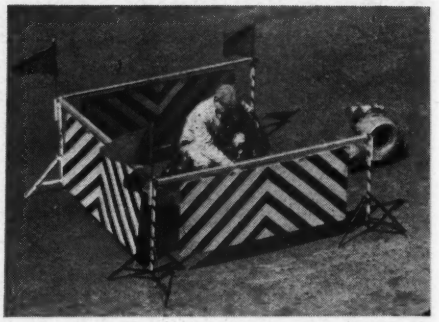
For the inside diameter, either measure the pipe as shown, or consult a handbook giving the inside and outside diameters of standard pipe. The inside diameter of the gasket should be the same as the inside diameter of the pipe to avoid water or gas pockets.

This method is better and quicker than the usual procedure of measuring from center to center of the bolts and subtracting the diameter of the bolt.

## Safety Guard

**TOM BRETLAND, first class steamfitter, steam heating department, Dayton Power and Light Co., Dayton, Ohio.**

In order to provide greater protection to servicemen working at open manholes, this guard was devised as a means of insuring that the attention



of approaching motorists be directed toward the manhole with ample safety margin. Greater visibility and an appearance of solidarity, which serve to produce an immediate reaction on the part of drivers, were achieved.

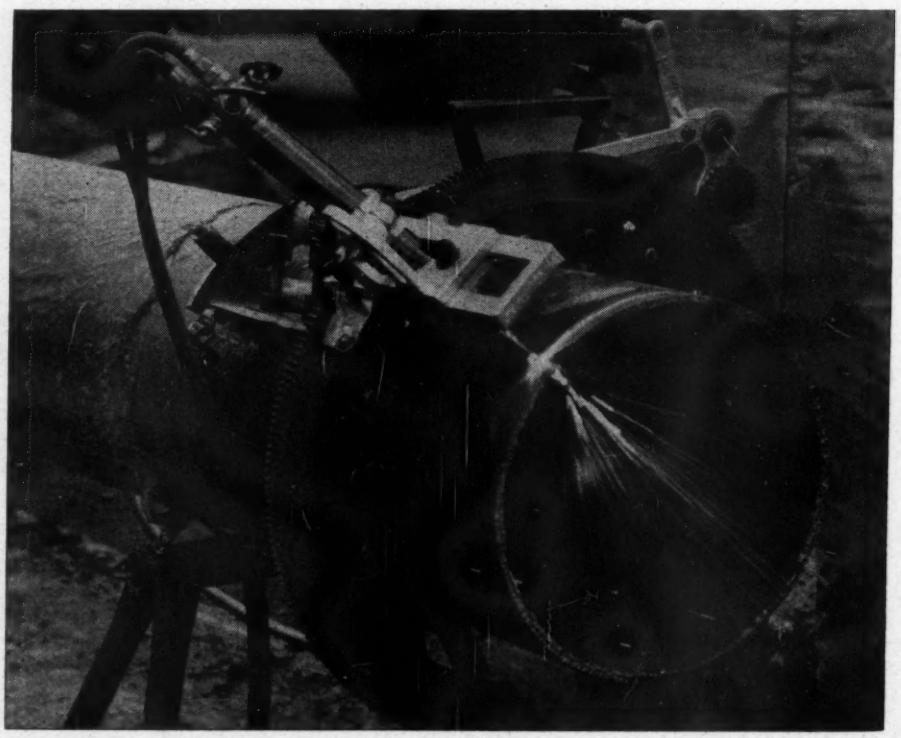
The unit is portable, can be folded into a flat, compact piece which can be carried, stretcher fashion, by two men. The four stands and angle iron top pieces are collapsible. The striped sides are reversible for day or night use: by day, the surface which shows black and yellow is turned to the outside; at night, the reverse surface of yellow and galvanized stripes, which reflect car lights better than completely painted sides would, are exposed.

## Pipe Beveler Speeds Up Installations

**Pipe beveler in use by the San Diego Gas and Electric Co., San Diego, Calif.**

Pipe installations have been speeded up by the use of the beveler. The apparatus consists of a large gear wheel which fits over the pipe and is locked into place by a clamp and chain. The large gear forms a track for a small carriage which holds the acetylene torch. When the operator turns a crank, the torch revolves slowly around the pipe, making the cut.

The entire operation now takes from two to three minutes.



Busy day—
Quick Dinner
How to Curtain "Problem" Windows
How to Restore Old Furniture
Yum! Yum! Fried Chicken Dinner!
OUTSTANDING ARTICLES CONDENSED FROM AMERICA'S LEADING WOMEN'S MAGAZINES

How to defrost frozen foods
You can have an Indoor-Outdoor Kitchen
Clean and cool as all outdoors—this New Freedom gas kitchen
Not even a Whisper!
Just turn the tap!
SPECIALLY WRITTEN STORIES ON THE LATEST GAS APPLIANCES
Servel, Inc.
EVANSVILLE 20, INDIANA

# California Is Kitchen Conscious

## Thousands See May Co.'s Kitchens; New Freedom Stars at Home Show

KITCHEN interest among Southern California's housewives was doubly stimulated last month. Following on the heels of the May Co.'s opening late in June of its Wilshire Boulevard, Los Angeles, appliance store, featuring 12 gas, electric, and combination kitchens, home planners were treated to a ten-day display of New Freedom and electric kitchens at the Construction Industries Exposition and Home Show at the Pan Pacific Auditorium in Los Angeles, starting July 12.

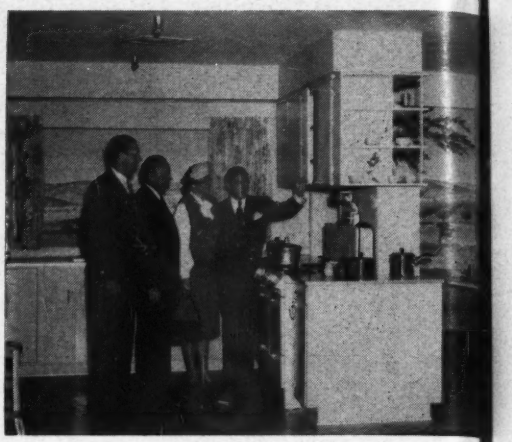
Seven model gas-fired kitchens held a prominent place in the home show. Located near the main entrance to the auditorium, they attracted thousands of forward-looking families. Planned and built by the Natural Gas Bureau of the Southern California and Southern Counties Gas Co.'s, the kitchens included two Pullman-type, three U-shaped, and two L-shaped rooms designed as answers to varying space and shape problems in Southern California homes.

The May Co. display is a permanent installation. All the kitchens are arranged along one wall, with partitions separating them, and give the appearance of a giant showcase. And everything works. The turning of a knob or the pressing of a button will set any of the appliances in action, giving a practical demonstration—a silent, graphic sales talk. Each kitchen is completely decorated.

Two of the most attractive kitchens in the May Co. showing are the Servel and Libbey-Owens-Ford units. Servel is emphasizing an air control cabinet over the range which removes steam and vapors from the room, leaving it free of cooking odors. Handy bins at the bottom of the cabinets utilize waste space and provide a place for spices and other small, often-needed household items.

Libbey-Owens-Ford's kitchen makes extensive use of glass—in the specially-designed, Mutschler oak cabinets with glass fronts, in the dining table tops, and in the dining patio mirror with sandblast design. Gas appliances in this kitchen are by Servel and Tappan.

**Views of the Construction Industries Exposition are shown above, below, and at right. Above, Servel's Fingertip shelves, at the base of the cabinets, and air control cabinet over the range, are featured. Below, exterior view of New Freedom display.**



**May Co. and gas company officials inspect the Southern California Gas Co. kitchen at the May Co.'s new store.**

**Extensive use of glass in the Libbey-Owens-Ford kitchen at the May Co. is revealed in the glass-front Mutschler oak cabinets.**

**Western Holly's range and the Servel refrigerator share the spotlight in this kitchen at the Construction Industries Exposition.**

# Each year, for 67 years, Hardwick Ranges have won an ever-increasing number of friends.

# ...Why?

HARDWICK GAS RANGES ARE

## TOPS IN COOKING PERFORMANCE

HARDWICK GAS RANGES ARE BUILT OF FINEST MATERIALS, BUILT BY SKILLED CRAFTSMEN,

## BUILT TO ENDURE

HARDWICK GAS RANGES ARE

## PRICED TO SUIT 8 OUT OF 10

*TOO EXPENSIVE FOR ONE*

*JUST RIGHT FOR EIGHT*

*NOT ENOUGH GADGETS, NOT EXPENSIVE ENOUGH FOR ONE*

HARDWICK Gas RANGES

**HARDWICK STOVE COMPANY**
CLEVELAND, TENNESSEE
*The Quality Line Since '79*

# PEOPLE

G. R. Maddox

• **G. R. Maddox,** who recently received his discharge after 3½ years of service in the army, will take charge of Clark Bros. Co.'s branch office soon to be opened in Caracas, Venezuela. Prior to the war, Maddox spent eight years in Venezuela in the production and engineering department of the Standard Oil Co.

**T. R. Foster,** previously associated with the Carrier Corp., has joined Clark at Olean, N. Y., where he will head the centrifugal compressor sales department.

**Joe Y. Allen, Jr.,** is a new engineer in the technical service department at Clark's Houston office. Allen served in the navy during the war, and prior to that was employed by the Gulf Oil Corp.

• **Tom H. Hall,** who has been with the Pacific coast division of the Geo. D. Roper Corp. for the past 26 years, is now manager of the Pacific coast division, with headquarters in Los Angeles. The division includes California, Oregon, Washington and Arizona.

**William L. Plummer,** who served with the army air forces for the past four years, has returned to Roper as southern division manager. Plummer has served with Roper for 20 years and will supervise the sale of Roper ranges in the eight states in his territory.

• **J. D. Gordon** has been appointed southwestern representative of the new Tulsa office of the gas processes division of The Girdler Corp. Gordon was formerly the division's eastern representative and is being succeeded by **D. Kenneth Finlayson,** whose headquarters will be in New York. After graduation from college, Gordon was associated with the Swann Chemical Co., of Birmingham, Ala., and he joined the Girdler Corp.'s gas processes staff in 1939.

• **Floyd C. Brown,** vice president and general manager of Natural Gas Pipeline Co. of America, has been elected president of that company. He succeeds **Alton Jones,** who will serve as chairman of the board. Brown will continue his duties as general manager. He has also been elected president of the Texhoma Natural Gas Co. and the Quadrangle Gas Co.

• **C. E. Schoene,** formerly superintendent of distribution for The Laclede Gas Light Co., St. Louis, is now chief engineer of that company. Schoene replaces **John H. Doerres,** who died on July 2.

• **Robert H. Owens** recently was elected vice president in charge of engineering and manufacturing of Roots-Connersville Blower Corp., Connersville, Ind., one of the Dresser Industries. An engineering graduate of Purdue university, Owens has been active in engineering and research since 1912. He joined the engineering staff of Roots-Connersville in 1925, and since that time has been responsible for many new centrifugal blower and compressor developments.

• **W. E. Sivers,** former president of Security Engineering Co., Inc., Whittier, Calif., has been elected chairman of the board, and **O. Hammer** has been elected president and general manager. **R. M. Cook,** vice president and general sales manager, is conducting a sales and service expansion program for Security products throughout the U.S., and new warehouses and offices are being constructed in Oklahoma City and Odessa, Texas.

H. W. Baird

• **George B. McComb,** in charge of protective coating sales for The Barrett Division, Allied Chemical & Dye Corp., New York City, announces the appointment of **Hugh W. Baird** as district sales supervisor for the division, with headquarters in Chicago. Baird has been identified with the steel pipe business for many years, because of his association with the National Tube Co., Pittsburgh.

• **Herbert J. Smith** has been appointed superintendent, telephone department, Equitable Gas Co., succeeding **V. H. Dake,** who retired July 1. The telephone department serves the Philadelphia Co. and Subsidiary Co.'s and the Pittsburgh Railways.

• **Leslie Brandt,** assistant to the vice president in charge of finance and personnel, Peoples Gas Light & Coke Co., Chicago, has been appointed director of employee relations. He will also continue in his former capacity.

D. D. Williams

• **Donald D. Williams** has joined the water heater sales division of A. O. Smith Corp. and will give technical assistance in the sale of both domestic and commercial water heaters under the direction of **James F. Donnelly,** product supervisor. From 1932 to 1943 Williams did sales engineering work for the Iowa-Nebraska Light and Power Co., and part of that time he was in charge of industrial gas sales and installations for the company. In 1943 he took a position with the seventh service command of the army as a civilian mechanical engineer on heating and volume water heating. He left that post to join A. O. Smith on June 1.

C. G. Wood

• **Clarence G. Wood** has joined The American Coach & Body Co. as manager of sales promotion. He will establish an overall sales program and will handle the promotion of several new lines. In 1914 Wood became vice president and secretary of the Hoosier Auto Parts Co., Muncie, Ind. After serving a year and a half in the army, he returned to Hoosier and also founded an engineering company. In 1927 he established the Auto Prime Pump Co., which he sold in 1931 to become director of sales and engineering for the Monmouth Products Co., Cleveland. He founded two other businesses before being recalled into the army in 1942. Upon being released from service in November, 1945, and before joining American Coach & Body, Wood set up a distributing organization handling machine tools and abrasive discs.

• Rochester Gas and Electric Corp. has announced the appointment of two new department heads to fill vacancies created by recent deaths. **Sydney Alling** replaces the late **Ivar Lundgaard** as manager of the industrial department, and **Ralph H. McCumber** has been appointed superintendent of the electrical department to succeed **Walter J. Consler,** recent automobile accident victim.

• **W. L. Hutcheson,** sales manager of The Manufacturers Light & Heat Co., Pittsburgh, Pa., has announced the appointment of three new home service directors for the company and its affiliates. **Wanda M. Ewing** is the new director in Wheeling, for the Natural Gas Co. of West Virginia; **Evelyn M. Porter** takes over for Manufacturers in the Uniontown, Pa., area; and **Helen Wilcox** is in charge of home service for Binghamton Gas Works in Binghamton, N. Y.

• **Norman R. McKee,** vice president, Southern Counties Gas Co., Los Angeles, has announced the appointment of **Constance Weiss** as home service director for the Santa Monica Bay district, succeeding **Marjorie Fischer.** Miss Weiss had been assistant home service director since joining the company in September, 1945.

• **Charles E. Reitzel** has been appointed auditor of receipts of the electric, gas, steam, and merchandise receipts division of the accounting department, Philadelphia Co. and Subsidiary Co.'s, Pittsburgh, according to an announcement by **C. T. Harmon,** controller for the companies.

• **Calvin Verity,** executive vice president and general manager of the American Rolling Mill Co., Middletown, Ohio, succeeds **Frank M. Tait** as a member of the board of directors. Verity has been with American Rolling Mill since 1911.

• **Howard C. Clark,** former navy lieutenant and veteran of four years of action during the war, has returned to the staff of the A.G.A. Testing Laboratories. Clark first joined the laboratories in 1940.

# THE *Top Griddle* IS BACK

WEDGEWOOD'S popular divided top model with built-in griddle is back. Once more Western housewives can enjoy this ideal device for hotcakes and frying, for warming plates and keeping foods hot. The top griddle increases cooking top over 50%, is removable for easy cleaning, drains greases into special removable grease drawer, and burner is self-lighting.

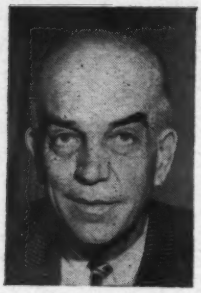
MODERNS PREFER GAS

**FOR ALL GASES, INCLUDING LP (LIQUEFIED PETROLEUM) GAS**

**WEDGEWOOD** LEADER IN THE WEST

JAMES GRAHAM MFG. CO.

LOS ANGELES • GENERAL OFFICES & FACTORY, NEWARK, CALIF. • SAN FRANCISCO



J. J. Palmer

• **John J. Palmer,** a veteran of nearly 40 years in the automobile and allied industries, has been named manager of the Newport News, Va., plant of Gar Wood Industries, Inc., it was announced recently by **John J. Bergen,** chairman, and **Charles W. Perelle,** president. Palmer was formerly vice president of the Horace E. Dodge Boat and Plane Corp., whose properties have been leased by Gar Wood for its Newport News plant where it will make motor boats and light road machinery.

• **Lt. Col. Robert L. Melvin,** now back on the job as American Stove Co.'s representative for heavy duty equipment in New England, recently was presented with the Legion of Merit medal by **Lt. Gen. Oscar W. Griswold** in Boston. Melvin, a veteran of World War I, had the assignment in this war of making soldiers out of misfits, AWOL's, gangsters and jailbirds.

• **Frank Spratt** has been appointed sales representative for Day & Night Manufacturing Co., Monrovia, Calif., in the southeastern territory, with headquarters in Montgomery, Ala. Spratt, who served with the navy for two and one-half years, formerly held a similar position with Day & Night in the central California territory. He replaces **Alvin Flannes,** who has accepted a position with Cowan Supply Co., Day & Night distributor in Montgomery.

• **L. Harold Anderson,** president of the California Railroad Commission since Jan. 4, 1945, recently announced his resignation effective Aug. 1, to accept a position as vice president of the Pacific Gas & Electric Co. **J. B. Black,** PG&E president, said Anderson's duties will include special assignments pertaining to the construction and operation of the company's properties and its customer relations.

• **Mrs. Edith M. Bentley** was elected president of the Titan Valve and Manufacturing Co., Cleveland, Ohio, at a recent meeting of the directors. Mrs. Bentley fills the office of her deceased husband, **Wm. T. Bentley. Frank A. Onda** and **Taylor G. Nelson** will handle the active management of the company.

• **George M. Sheets,** who has been sales supervisor of the Iowa-Illinois Gas & Electric Co., Iowa City, Iowa, since the organization of that company, resigned as of Aug. 1. Sheets is taking up new duties with "Central Surveys," a market analysis and sales survey organization headed by **Charles Parker** of Shenandoah, Iowa. Central Surveys serves gas and electric utilities of the United States and Canada.

• **George P. Garver** has been elected secretary-treasurer of the Natural Gas Pipeline Co. of America. He was associated with this company before serving in the navy during the war. Garver is a son of **Judge Robert D. Garver,** chief counsel of The Gas Service Co., Kansas City.

# CONVERT THAT SMALL CITY GAS DISTRIBUTION SYSTEM!

**Realizing the great economic value, uniform dependability and convenience of Liquefied Petroleum Gases, operators of small city gas distribution systems are converting their systems from manufactured gas to Butane and Propane. The important factors bringing about this equipment and plant modernization are:**

1. **Reduced Operating Costs**
2. **Savings in Labor**
3. **Lower Maintenance Cost**

**Warren is one of the world's largest producers and marketers of Liquefied Petroleum Gases. Our engineering department is helping operators give more dependable service with more economical operation. Convert your plant to Liquefied Petroleum Gas immediately.**

**Contact your nearest Warren office.**

**WARREN PETROLEUM CORPORATION**
TULSA, OKLAHOMA
Detroit Mobile Houston


## Obituaries

G. B. Crowther

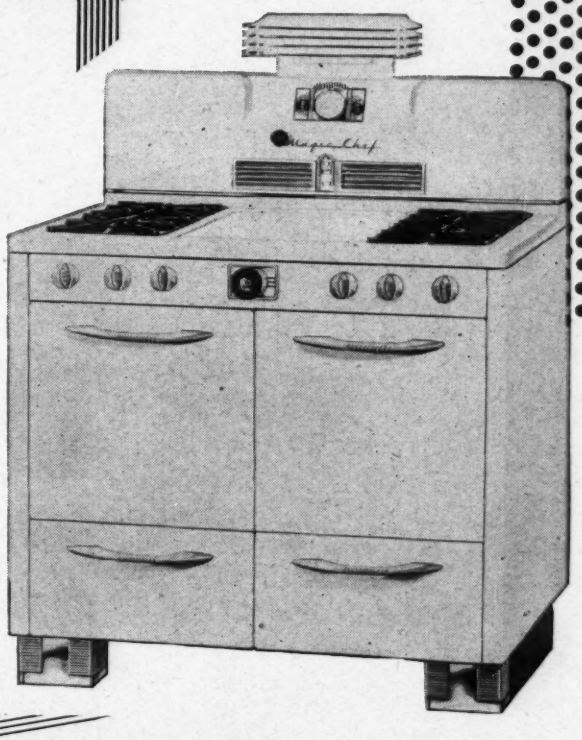
• **George B. Crowther,** 52, personnel director of the Cincinnati Gas & Electric Co., died Saturday, July 6, at his home in Cincinnati. His death came within a few minutes after he suffered a stroke. Crowther joined CG&E in November, 1922, as a wiring salesman. Later he became a salesman in the investment department, and he had been personnel director since inception of that department on June 1, 1929.

• **Richard A. Ford,** general manager of Canadian River Gas Co., Amarillo, Texas, died on June 7. Ford became production superintendent of Canadian River in 1928 when the company was formed. In 1936 he was promoted to general superintendent and seven years later was made general manager.

• **John H. Doerres,** chief engineer of The Laclede Gas Light Co., St. Louis, died suddenly of a heart attack on July 2. Doerres became chief engineer of the company upon the retirement of **H. C. Wehnert.** He was formerly superintendent of Laclede's by-product coke oven plant.

# *More Women Cook on*
# *Magic Chef*
# *than on any Other Range*

★ National (impartial) surveys prove the overwhelming popularity of Magic Chef. This nation wide consumer acceptance can be attributed to Magic Chef leadership in giving their dealers the finest range available backed by 26 years of the strongest national advertising program in the gas range industry. The end result—Magic Chef is the easiest range of all to sell.



**AMERICAN STOVE COMPANY**
**4301 Perkins Ave. • Cleveland 3, Ohio**
New York • Atlanta • Philadelphia • Chicago
Cleveland • St. Louis • Los Angeles

THE GAS RANGE WITH THE FAMOUS RED WHEEL

*The* **EASIEST** *Range of all* **TO SELL** *!*

## Canadian River Reduced Rate Schedule Filed

Rate schedules reducing by not less than $551,000 the charges for natural gas sold by Canadian River Gas Co. to Colorado Interstate Gas Co. have been accepted for filing by the FPC. The new schedule provides a rate of 3.5¢ per Mcf, plus certain transportation charges of about 1¢ per Mcf, for gas sold to Colorado Interstate at Gray, Okla., for resale to Natural Gas Pipeline Co. of America; and a rate of 4¢ per Mcf for gas sold to Colorado Interstate at Clayton, N. Mex., for resale to its customers in Colorado.

FPC, in accepting this schedule for filing, also accepted for filing two other rate schedules which permit Canadian River and Colorado Interstate to retain in effect certain features of their present contract.

The $551,000 reduction in the cost of gas to Colorado Interstate is reflected in rate schedules of that company which were accepted by the commission several months ago.

## Peoples Gas Light & Coke Curtails Gas for Heating

B. H. Wittmann, domestic sales manager, The Peoples Gas Light and Coke Co., Chicago, recently announced that his company cannot supply gas for new or additional space heating installations until April 30, 1947.

Reasons for this curtailment are the impossibility of getting materials for new pipe line construction needed to supply additional gas, and the increasing demands of new and present consumers. Service will be rendered only to customers whose premises were heated with gas during the past winter, customers whose gas heating equipment is now installed or in process of installation, and residential customers whose dwellings have been completed since Jan. 1, 1946, or are now under construction if gas was specified in the original plans.

## Linde Air Products Opens New Plant in Amarillo

A new plant which will house an acetylene producing plant as well as consolidating all present producing and warehousing operations has been opened in Amarillo, Texas, by the Linde Air Products Co., a unit of the Union Carbide and Chemical Corp. Included in the structure is a warehouse for distribution of Union carbide and Carbic processed carbide.

Site of the new facility is at N.E. 3rd Ave. and Philadelphia St., where the company has operated an oxygen plant for a number of years.

## Pipe Contract Awarded For Texas-California Line

Southern Counties and Southern California Gas Co.'s have announced that construction of their portion of the Texas-to-California pipe line is scheduled to start early next year. A contract has been awarded to Bechtel Brothers-McCone Corp. for cleaning, coating and wrapping the 30-in. pipe which will be installed on the California companies' 214-mile portion of the line.

B. M. Laulhere, who is in charge of the engineering staff, stated that due to the size of the pipe, it will have to be wrapped at a central location. Southern Counties has leased a 10-acre site adjoining the Consolidated Aircraft plant at Downey, Calif., where the pipe will be fabricated, and Bechtel-McCone will install on this site, facilities necessary for the cleaning, coating and wrapping.

## Porcelain Enameling Plant Turns Out Steel Kitchens

American Central Manufacturing Corp., Connersville, Ind., has completed construction of a modern porcelain enameling plant for production of all-steel kitchens. The plant, which cost nearly three-fourths of a million dollars, ranks in size with the top ten such plants in the United States, according to M. D. Schnell, superintendent.

A number of modern and seldom used production methods are employed along the mile-long conveyor system. Among them are a water treatment installation which softens or deionizes water, air conditioned spray booths, and electro-dryers which deliver moisture and oil-free air to the spray guns.

During the war, American Central produced 500,000 jeep bodies and thousands of aircraft assemblies.

## East Ohio Required To Comply With FPC Orders

The FPC has found the East Ohio Gas Co., Cleveland, Ohio, to be a natural gas company within the meaning of the Natural Gas Act and has directed the company to file a statement of the original cost of its properties, reclassification of accounts, and annual financial and statistical reports.

At a hearing early this year, East Ohio was ordered to show cause why it is not a natural gas company subject to provisions of the Natural Gas Act, and why it has refused to comply with the act and with FPC orders. The commission found that there was no cause or justification for such failure to comply.

## National Tube Co Expands Gary and Lorain Plants

C. R. Cox, president of National Tube Co., a U. S. Steel subsidiary, has announced an improvement program for the National plants at Lorain, Ohio, and Gary, Ind. The projects are scheduled to start very soon and will require about two years for completion.

An entire new Bessemer steel plant and four new mills will be installed at Lorain, increasing the pipe capacity about 15%. At the Gary plant some government-owned equipment installed during the war has been purchased by National, and additional facilities are being installed, increasing the yearly capacity of the Gary plant by about 170,000 tons.

## Richmond Gas Firm Sold

Edwin B. Horner, president of the Petersburg and Hopewell Gas Co., Richmond, Va., has announced the sale of the company to Scott, Horner & Mason, Inc., of Lynchburg, Va. Michael E. Shea, president of the Lynchburg and Roanoke gas companies, also will be president of the newly-acquired utility. The properties were purchased from the Pennsylvania Gas and Electric Corp. of New York.

## American Coach Develops Gas Utility Truck Body

A new standard utility truck body, designed for use in meter changing and general gas maintenance and repair work, and mountable on a ¾-ton or one-ton chassis, has been built by the American Coach & Body Co., Cleveland, Ohio.

Known as the American Gas Meter Installation Body Type 4750, the unit has side boxes and a sliding tray which can be equipped with compartments accommodating 31 gas meters. Iron gas meters can be substituted if desired.

The lower compartments on both sides are equipped with bins for fittings, tools, and equipment. Meter keys up to 7½ ft. can be carried inside a compartment with access from the rear of the body.

Optional equipment includes a full-length sliding tray, which when removed permits hauling of stoves or refrigerators, a tarpaulin cover, pipe carrier rack and pipe vice carrier bracket, among other features.

## Oklahoma Gas Encourages Glass Making Industry

Large supplies of natural and liquefied petroleum gas from nearby pipe lines and refineries have given the glass industry a permanent place among Oklahoma enterprises, J. Gene Iliff, purchasing agent of Bartlett-Collins Glass Co., Sapulpa, Okla., told members of the Tulsa Engineers club at a recent meeting.

Glass making had its first plant in Oklahoma at Bartlesville about the time the state was admitted in 1907. Today it has 11 plants in the state located at Sand Springs, Sapulpa, Okmulgee, Henryette, Muskogee, Blackwell and Ada, the speaker said.

## Leo T. Crowley Denied Directorship of Utilities

Leo T. Crowley, Chicago, has been denied authorization, under the Federal Power Act, to continue to serve as director of Duquesne Light Co., Louisville Gas & Electric Co. and Wisconsin Public Service Corp. During the 18 months preceding his application to the FPC, Crowley attended none of the meetings held by the directors of Wisconsin Public Service and Louisville Gas and Electric, and only one held by Duquesne.

Crowley was also denied permission to serve as chairman of the executive and financial committee of Duquesne Light Co.

## Houston Natural Adopts Wage and Hour Adjustments

The Houston Natural Gas System has adopted wage and hour adjustments, following a comprehensive study of employee problems. Wages and salaries being paid as of Feb. 28, 1946, provided the basis for the study, since the detailed survey was begun at about that time.

The normal work week for Houston and outside field employees has been reduced from 54 to 48 hours. All Houston office workers are now operating on a 40-hour instead of a 43-hour week. Personnel in the outside district offices will continue to work a 44-hour base week.

Thousands of housewives are waiting to buy new, modern gas ranges. They have the desire, and the means, to buy the *best.* Our consumer advertising program is telling these women that ranges equipped with the Harper Center Simmer Burner are definitely superior... that the Harper "2 burners in 1" top burner saves up to 39% on gas, keeps kitchens up to 9 degrees cooler, saves hours of kitchen pot-watching weekly, and makes possible many other advantages symbolized by the Harper seal.

You can *demonstrate* these advantages to your customers. There is no surer way to close sales on higher-priced ranges . . . to augment the position of gas as the ideal cooking fuel through promoting appliance improvements that give better cooking results. Scores of helpful pointers on how to demonstrate effectively are contained in our booklet "How to Sell More Gas Ranges." Copies are available for your staff—FREE. Simply address: Harper-Wyman Company, 8562 Vincennes Avenue, Chicago 20, Illinois.

*NOW...we're telling your Customers-*

about the new, improved

# HARPER

## CENTER SIMMER BURNERS

*...in leading magazines*

Before Buying Your
NEW RANGE
make sure it has the famous
HARPER CENTER SIMMER BURNERS
look inside for the booklet with this seal
The Harper Center Simmer Burners are superior to ordinary top burners because each Harper burner is really 2 burners in 1. As shown in diagram, the big outer burner brings foods to a quick boil. Turn handle until it "clicks" and the big burner goes out, leaving only the small, efficient inner burner lit to finish the cooking.
Only the separate Harper Center Simmer gives you the controlled low heats you need to keep foods warm for serving...to eliminate pot watching and boiling dry...to allow cooking with little water, which saves time and gas and keeps the average kitchen 9 degrees cooler. Only the Harper separate Center Simmer can help you so much in your cooking.
Insist on Harper Burners!
•18 Leading Gas Ranges are Harper Equipped
2 BURNERS IN 1
BOTH BURNERS ON
OUTER BURNER TURNS OFF
INNER BURNER STAYS LIT
HARPER-WYMAN COMPANY, CHICAGO 20

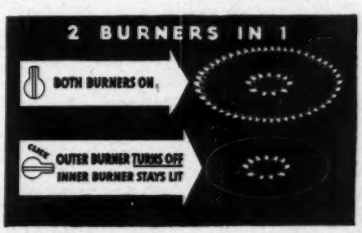
## OVER 21,500,000 READERS!

**Advertisements like the one shown here appear in the following publications, having a combined monthly readership of more than 21,500,000 women:**

Ladies' Home Journal
McCall's
American Home
Better Homes & Gardens
Woman's Home Companion

**Tie-in with this consumer advertising... *demonstrate* and talk the advantages of the Harper Center Simmer Burner when these women come in to *buy!***

*The Harper Center Simmer Burner operates on the unique principle of "2 burners in 1"...a STARTING BURNER for frying and to start foods boiling, plus a small, economical COOKING BURNER, to maintain the cooking...both controlled by the same handle. It is subject to finer gradations of low heats—greater control and economy—than any other top burner made.*




**HARPER CENTER SIMMER BURNER** *"...Holds the Lines for Gas"*

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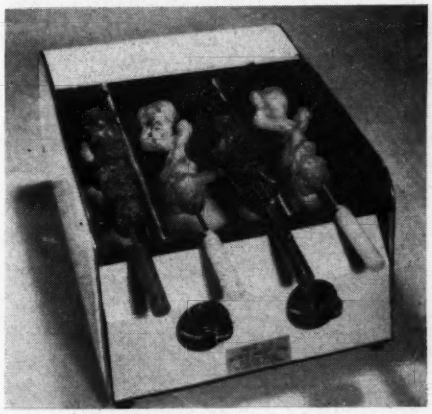
# NEW PRODUCTS

## Barbecue-Type Gas Broiler

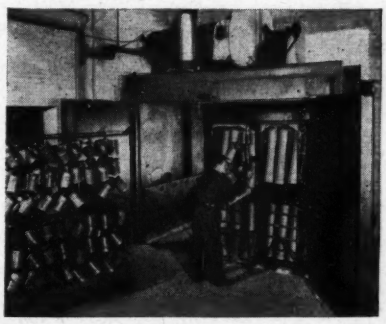
**David Nassif Co.,** Boston, Mass.
**Model:** Table-top barbecue-type gas broiler, Model H-8.
**Application:** For cooking an entire meat course within three minutes. Also cooks fish, poultry, and broils vegetables. Can be used indoors with gas or outside with bottled gas. Quick cooking prevents loss of meat juices.



**Description:** About the size of a portable typewriter, the broiler is equipped with four skewers which rotate automatically. For permanent installations, electric power is used to rotate them; for portable or outdoor units, stem-wind, clock-type motors are furnished. Handles are of colorful plastic. The body of the unit is porcelain enameled, with stainless steel trim.

## Finish Baking Oven

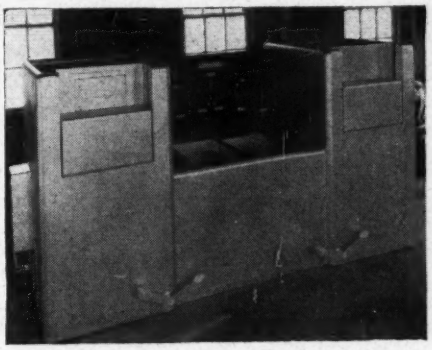
**Despatch Oven Co.,** 619 S.E. Eighth St., Minneapolis 14, Minn.
**Model:** Oven for high volume forced convection heat.
**Application:** To meet specialized processing requirements for baking corrosion-resistant plastic coatings on aluminum chimney liners.
**Description:** Initial tests showed that a forced convection oven was essential



for effective plastic coating of flue liners, since it is capable of providing uniform, high volume heat flow throughout the chamber with quick-response automatic temperature control. Processing requirements of the installation were unusual because of the size and shape of the flue liners and sensitivity of the plastic material to time and temperature variations. High volume heat flow was also necessary to achieve rapid, uniform baking, inside and out, of 450 liners per load when placed on racks in the oven. To meet the above requirements, a gas-fired rack loaded finish baking oven was installed, complete with recording heat control instruments and a large capacity chamber containing adjustable ports for close regulation of heat flow.

## Heat Treating Unit

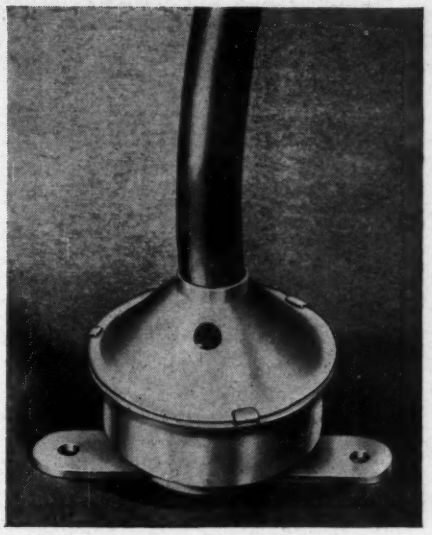
**Waltz Furnace Co.,** 1549 Elizabeth Place, Cincinnati 29, Ohio.
**Model:** Packaged gas-fired heat treating unit.
**Application:** Ideal for the small shop, industrial or vocational school, or any other place where a compact heat treating unit can fit into a manufacturing process.
**Description:** All operating parts such as blower, gas regulators, control valves and quench are in one completely as-



sembled unit. All that is necessary are gas and electrical connections. There are two furnaces: one is of 1400-2350° F range, automatically controlled, full muffle under fired type with a separate hearth floor inside the muffle; the other, suitable for tempering or drawing, is from 250-1100° F. range. Between the two furnaces are quench tanks, one for oil and one for water, and the instrument panel is in back of the tanks.

## Snap Action Thermostat

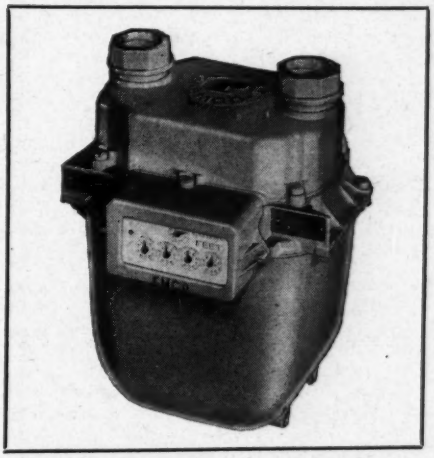
**Spencer Thermostat Co.,** Attleboro, Mass.
**Model:** Hermetically-sealed Klixon snap-action thermostat, model No. C-4910.
**Application:** Fixed-temperature, non-adjustable instruments for use in deep-freeze units, frozen food cabinets, bottle dispensers, refrigerated show cases, walk-in coolers, and in various heating applications. Either temperature regulation or high limit alarm is achieved through the use of this item.
**Description:** Minimum and maximum temperatures range from minus 10° to 120° F. With contacts closing on temperature rise, the minimum cooling temperature differential is 8°; with



contacts opening on temperature rise, maximum heating temperature differential is 10°. These settings are standard, but higher setting and wider differentials may be specified. The thermostat is actuated by a Spencer snap-acting disc mounted in thermal contact with the sealed housing,. Unaffected by ordinary vibration, they will operate in any position. Supplied ready to install with a heavy-duty, all rubber, two-conductor cord 30 in. long, they are available in the following A.C. and D.C. applications: 115-230 volts A.C., 10 amps., ½ hp., and 125 volts D.C., 1 amp.

## Domestic Gas Meter

**Pittsburgh Equitable Meter Division, Rockwell Manufacturing Co.,** 400 N. Lexington Ave., Pittsburgh 8, Pa.
**Model:** Rockwell-Emco #0 Domestic Gas Meter.
**Application:** Reduced weight decreases transportation costs and saves effort for trucker, installer and meter fitter in the repair shop. The meter case is



strong and corrosion-resistant, and is protected against unusual atmospheric conditions by a special lacquer coating.
**Description:** New metals and plastics are used in the working parts of this meter, and precision manufacturing techniques improve performance and lengthen valve life. Replacements and adjustments are made easily, and the meter weighs only 16½ lb. The outer case is made of pressure cast aluminum alloy.

# CURRENT READING

**The Investment Value of Injection Gas.** M. L. Arnold, Richfield Oil Corp. This paper is directed particularly to the men in the natural gas and gasoline divisions of the petroleum industry in the hope that it may arouse their more active interest in gas injection projects. For this reason, the discussion will be developed as follows: First, a brief statement of the necessity for and the objectives of gas injection; second, a discussion of the results of an economic analysis of a hypothetical project, by methods which are applicable to any type of injection project; third, a discussion of methods for making greater quantities of gas available for injection. Some of these methods, if found to be economically feasible and placed in operation, would greatly enhance the prestige of the natural gasoline divisions within the petroleum industry.

The statements of two experts on pressure-maintenance operations are referred to. Both of these support the view that the greatest possible ultimate recovery of oil from a reservoir will be obtained by maintaining the reservoir at its original pressure. To maintain the initial pressure it is necessary to return to the formation all of the gas produced plus enough additional gas to occupy the space containing the liquid volume of the oil withdrawn. Several possible sources for obtaining this gas have been discussed.

**Industrial Fire Brigades Training Manual**—Published by National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass. 188 pp., illustrated. $1.50, 15 or more $1 each. Although intended primarily for use in a large plant where a full-time fire brigade is maintained, the manual would prove valuable in smaller plants needing the essentials but not the details of a large plant setup. It serves as reference material where a plant brigade has already been organized.

The text incorporates instruction on all phases of effective fire-fighting, including organizing and training a fire brigade, use and care of materials and equipment, spotting and correcting or protecting against fire hazards, rapid and efficient use of operational equipment, salvaging, and periodic inspections.

**Carbon Dioxide in a Natural Gas-Condensate System**—F. H. Poettmann and D. L. Katz. "Industrial and Engineering Chemistry," May, 1946, pp. 530-534. Equilibrium constants for carbon dioxide in a natural gas-condensate system have been determined over the range 1 to 10 mole % carbon dioxide. Densities and molecular weights have been determined for saturated vapor and liquid phases for 24 hydrocarbon mixtures containing carbon dioxide at temperatures from 100° to 250° F. and pressures from 500 to 2900 psi. absolute. It is shown that the lower the molecular weight of the hydrocarbon in the binary carbon dioxide systems, the greater will be the deviation of the carbon dioxide from ideal behavior. Equilibrium constants of carbon dioxide in the natural gas-condensate system deviate most from the ideal equilibrium constants. Since the multicomponent mixtures consisted of over 60 mole % methane, the methane-carbon dioxide system may be expected to show wide deviations from ideal solutions.

**Efficient Heating and Scrubber System Allows Gas Metering at Full Line Pressure**—G. M. Wilson. "Oil Weekly," April 1, 1946, pp. 28, 29. Accumulation of hydrates, which in turn usually leads to the formation of ice in control orifices and chokes in the gas metering system has been successfully prevented in a somewhat unusual manner by the production department of Standard Oil Co. of California. In the majority of cases, gas is produced and regulated first, after which it is heated and run through the metering devices. In this particular instance however, the gas is taken from the several wells, passed at full well pressure through heat exchangers, and scrubbers, then to volume regulators, following which it is directed into the consumer lines.

**Shell Cycling Plant Designed for High Pressure Absorption.** C. C. Pryor "Petroleum Refiner," April, 1946, pp. 117-123. A new high-pressure cycling plant, designed for processing 100 MMcf per day of gas, has been completed and placed on stream by Shell Oil Co., Inc., in the Sheridan field of Colorado county, Texas. The plant, representing the company's first venture in cycling-plant operation, will produce a total of 6700 bbl. per day of products, including propane, isobutane, normal butane, isopentane, natural gasoline, and distillate. At full load, approximately 89 MMcf per day of residue gas will be returned to the field for injection into the reservoir at a pressure of 4350 psi, gauge. Described and illustrated.

**Gas-Conservation Projects are Active Over Wide Front**—C. J. Deegan. "Oil and Gas Journal," May 4, 1946, pp. 86, etc. as materials and manpower become available, the number and size of gas-conservation projects announced make it obvious that a major campaign is under way to conserve gas produced with oil and to check the venting and flaring that were once widespread.

**Comparative Thermal Values of Various Fuels Based on Their Respective Units of Weight or Volume.** "Power Plant Engineering," April, 1946, p. 110. A table is shown giving these values for natural gas, coke oven or city gas, blast furnace gas, producer gas, coke breeze, coke, coal, fuel oil, tar, and electricity.

**Bureau of Mines Report 3867**—Report on the Investigation of the Fire at the Liquefaction, Storage, and Regasification Plant of the East Ohio Gas Co., Cleveland, Ohio, Oct. 20, 1944, by M. A. Elliott, C. W. Seibel, F. W. Brown, R. T. Artz and L. B. Berger.

**Chemical Utilization of Natural Gas Limited Only by Commercial Demand**—A. L. Foster. "Oil and Gas Journal." May 4, 1946, pp. 83, 84, 91.

**Conversion of Dry Natural Gas to Liquid Fuels**—R. C. Alden. "World Petroleum," April, 1946, pp. 46-49, 70. All of the processes discussed in this report are concerned with the utilization of dry natural gas which, in general, is more than 90% ethane and lighter, methane being the predominent constituent. Developments on the conversion of natural gas to liquid fuels are now in about the following position: 1) A few years ago, the conversion of dry natural gas by the Fischer-Tropsch route was an uneconomic process; today it has reached the point where large scale operations are being currently planned by private industry; 2) private industry has developed many large scale processes for conversion of the heavier constituents of natural fuels, and is making rapid progress in the conversion of natural gas to liquid fuels along the lines of the most economic processes; 3) knowledge gained in the conversion of natural gas by the Fischer-Tropsch route will be directly applicable to the longer range projects looking toward the use of coal as a raw material.

**Gas-Diesel Engine Development**—R. Boyer. "Petroleum Engineer," April, 1946, pp. 150, etc. Introduction of the gas-diesel engine, able to burn gas fuel with diesel-cycle efficiency and to operate on combinations of oil and gas fuel, naturally evoked widespread interest and much discussion regarding the history of this development. In this article, tracing general history is not the purpose of the author, but rather to report progress of the line with which he is most familiar, a line that includes application of the gas-diesel principle to 2-cycle as well as 4-cycle and to both atmospheric and supercharged engines.

**Chemicals from Light Hydrocarbons**—J. E. Bludworth. "Petroleum Refiner," May, 1946, pp. 102-105. Presented is a general discussion of possibilities of manufacture of chemicals from lighter hydrocarbons and particularly propane. It is pointed out that more is involved than translation of laboratory-learned possibilities into commercial production. Proposal to utilize excess propane in the manufacture of a chemical must be accompanied by consideration of market demand for that chemical, and effect of increased supply upon the price.

**Universal Chart Gives Speedy Answers to Problems in Fluid Flow**—W. C. Woodman. "Power," May, 1946, pp. 75-77. Piping design depends on fluid nature and pipe interior surface. The charts shown speed cut-and-try solutions and facilitate selection of size commensurate with fluid pressure loss.

**Physical Constants of Paraffin Hydrocarbons**—Natural Gasoline Association of America Standard 2145 (1945). "Petroleum Refiner," May, 1946, p. 130. Physical constants are given for methane, ethane, propane, isobutane, n-butane, isopentane, n-pentane, n-hexane, n-heptane, n-octane, n-nonane, and n-decane.

**Future Outlook for Gas Transmission Lines**—M. L. Mayfield. "Petroleum Engineer," May, 1946, pp. 59, etc. Many new natural gas lines will be required to supply the steadily increasing demand for this high quality fuel.

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**Galvanic Couples and Cathodic Protection**—M. C. Miller. "Petroleum Engineer," May, 1946, pp. 55-58. A series of tests was conducted on buried pipes of different metals, arranged to permit correlation of galvanic currents, pipe-to-soil potentials over anodic and cathodic areas, and effects of increments of cathodic protection current on galvanic currents and pipe-to-soil potentials. These showed pipe-to-soil potentials at point where galvanic current (and resulting corrosion) was stopped; also meaning of pipe-to-soil potentials along the pipe line before cathodic protection is applied. The tests show that a more reliable method should be developed for determining minimum amount of current required for protection of buried metal structures.

**Sodium Chromate Effective in Combating Corrosion in Gas Wells**—C. K. Eilerts. "Oil and Gas Journal." May 18, 1946, pp. 124, etc. Sticks of sodium chromate dropped into a gas well which is subject to corrosion maintained inhibiting concentrations for more than 2 hours. The sticks can be injected into tubing against the fluid flow when the mean fluid velocity is not greater than 11 ft. per second. Many improvements in the method are necessary before the treatment becomes practical.

**Vapor-Phase Equilibrium Cell Aids Condensate-Field Studies**—C. J. Deegan. "Oil and Gas Journal," May 18, 1946, pp. 128, etc. A type of vapor-phase equilibrium cell developed, patented, and in use by Houston Laboratories, is proving valuable in developing information on retrograde-condensate reservoirs. The cell, as it is now operating, has a range from 0 to 300 psia, and from 0°to about 300° F., but modifications expected to be installed soon will extend the pressure limits to around 9500 psia., and increase the temperature limit to about 350° F. Described and illustrated.

**The Relation Between Well Spacing and Recovery**—W. V. Vietti, J. J. Mullaine, O. F. Thornton and A. F. Van Everdingen. This paper was presented to the Division of Production Group Session on Well Spacing before the twenty-fifth annual meeting of the American Petroleum Institute in Chicago, Nov. 14, 1945. The choice of well locations (spacing) should be based upon the principles which govern reservoir performance, and not upon empirical formulas proposed in the early days of the petroleum industry.

**Natural-Gas Reserves**—E. DeGolyer. "Oil and Gas Journal," May 4, 1946, pp. 80-82. The proved natural-gas reserves of the United States are estimated to be in excess of 140 trillion cu. ft. as of Jan. 1, 1945. A summarized breakdown of the estimated reserves by the administrative districts as set up by the Petroleum Administrator for War, together with a partial breakdown by states, is shown in a table.

**The Evaluation of Data.** V. V. Kendall, National Tube Co. Discussion of problems involved in evaluating data on corrosion tests. For publication in Proceedings of the Water Conference, Engineers Society of Western Pennsylvania. 6 pages.

**Pipe-Line Construction.** "Oil and Gas Journal." May 4, 1946, pp. 92, 93. A report on natural gas pipe line projects.

Hoyt

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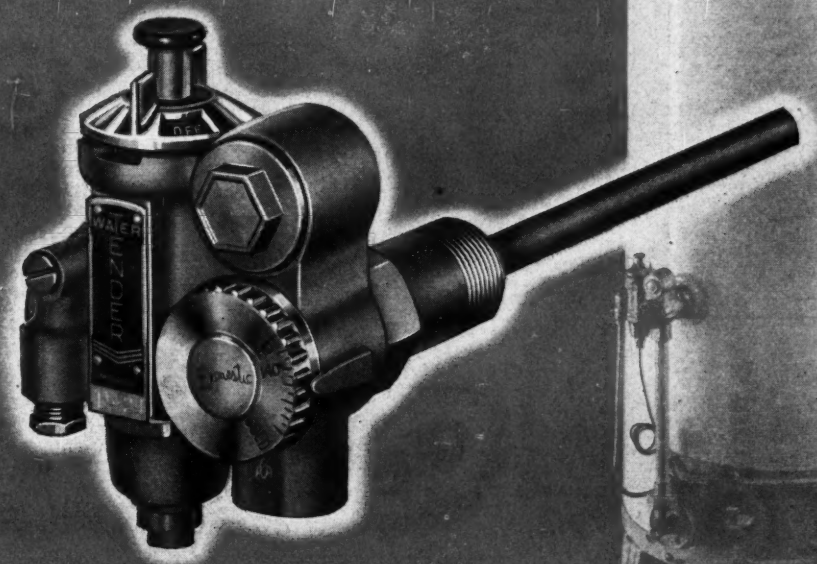


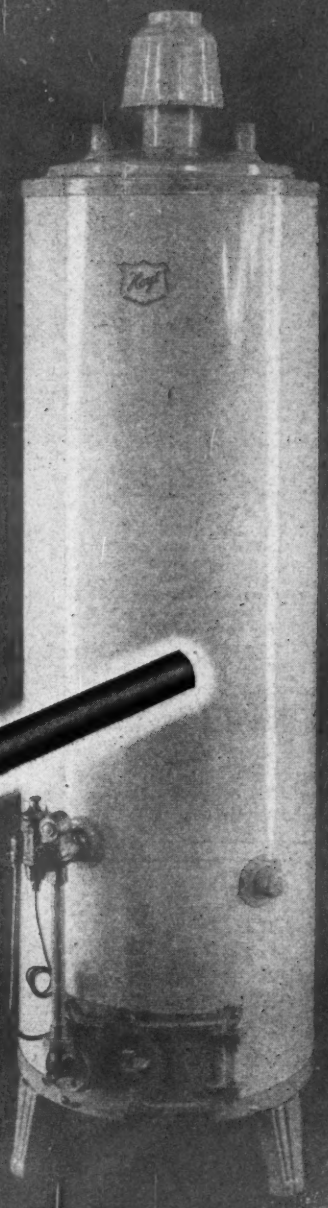

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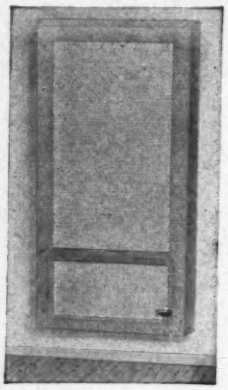

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# PIPE LINE NEWS

• The **Oklahoma Corporation Commission** has agreed to file a petition to intervene in Federal Power Commission hearings for two proposed natural gas pipe lines from the three-state Hugoton field to northern terminals.

Floyd Green, conservation attorney, said the commission action is based on the belief that support should be given companies which propose to serve new markets.

One of the applications involves the **Mid-Continent Natural Gas Transmission Co.,** which proposes to build a pipe line from the Kansas sector to the Mesabi iron range of Minnesota and the Michigan-Wisconsin pipe line from the Hugoton field to the Detroit area.

The other is an application of **Cities Service Gas Co.,** now pending before the FPC, for a 405-mi. gas pipe line from the Hugoton area to the Wichita, Kan., and Kansas City marketing areas. Cities Service is now a major purchaser in the Guymon sector with a line from Guymon to Blackwell, Okla., connecting with its trunk system from central Oklahoma to Kansas City.

• **Arkansas Western Gas Co.,** Fayetteville, Ark., has been granted a franchise to distribute gas in Wynne, Ark., beginning about Jan. 1, 1948. The company plans to bring gas lines from Memphis to West Memphis, Ark., Earle, Turrell, Marion, Parkin, Wilson, Hughes, Brinkley, Blytheville, Helena, West Helena, Harrisburg, Osceola, Forrest City and Paragould.

Last month the company completed a 6-in. line which is expected to double the capacity of natural gas which can be piped from Fayetteville to Springdale, Ark. The line, which cost $50,000, will also improve service to Rogers, Siloam Springs and Bentonville.

• The FPC has authorized **Tennessee Gas & Transmission Co.,** Houston, to construct facilities designed to increase by 118 MMcf daily the capacity of its 1265-mile pipe line from Driscoll, Texas, to Cornwell, W. Va. Estimated cost of the project is $27.4 million. Construction planned includes about 430 miles of looping and feeder lines, as well as three compressor stations and 18 new compressor units. A line to the San Salvador field in Texas is expected to enable the company eventually to use 40 or 50 MMcf daily of flare gas now being burned. The construction program will increase the company's daily capacity to about 380 MMcf.

• **Arkansas Louisiana Gas Co.,** Shreveport, La., has been authorized by FPC 1) to continue operation of its "L System" constructed during the war to serve Arkansas war plants; 2) to continue operation of facilities authorized for wartime use to supply gas to the **Ozark Ordnance Works,** El Dorado, Ark., and the **Shumaker Naval Ordnance Plant,** and 3) to construct additions to the "L System" to render additional service and to remove portions of the line no longer needed. Facilities to be constructed include about 28 miles of pipe line, and the estimated cost is $530,391.

• **The Arkansas Western Gas Co.** recently began construction of a new 4-in. main to increase supplies of natural gas to Rogers, Ark., according to L. L. Baxter, president of the company. The line, under construction by the **James Construction Co.** of Little Rock, will cost $50,000 and will tie into the company's northwest Arkansas main near Rogers, supplementing a 4-in. line through which the city has been served since installation of natural gas more than 15 years ago. The company recently completed seven miles of extensions to the city distribution system at a cost of more than $50,000.

• The FPC has authorized **Cities Service Gas Co.** to begin work in August on two projects in Oklahoma estimated to cost $1,075,000. The company will lay 64¼ miles of 12-in. line from the West Edmond field in Oklahoma to the Drumright, Okla., compressor station. The other project is a 6½-mile 16-in. line from the company's Craig storage field.

Completion of the two lines will give Cities Service Gas approximately 50 MMcf daily of additional gas to meet peak load demands.

• A 15-mile pipe line is to be constructed to supply gas, for cooking and heating, to the pure atomic research station at Los Alamos, N. Mex., according to an announcement by officials of the **University of California.** In the future, buildings at Los Alamos will be of permanent construction under supervision of a planning commission. Other improvements planned include a permanent and adequate water supply and a central sewage disposal plant.

## Southern Counties Surplus Gas Sold to Union Sugar

Southern Counties Gas Co. has contracted to supply surplus natural gas to Union Sugar Co. for a refinery at Betteravia, Calif. Union is planning to expand production at this plant, and has 2500 acres of sugar beets planted in Imperial Valley. The surplus gas contract, to be authorized by the California Railroad Commission, calls for a minimum of 3000 Mcf a day at 12 cents per Mcf until Oct. 1 and 14 cents thereafter.

## Rate Hearing Scheduled

Hearing will be held by the Arkansas Public Service Commission Sept. 9 on an order requiring the Southwestern Gas & Electric Co., Shreveport, La., to show cause why it should not reduce its rates to consumers.

The company serves 18,228 customers in 60 Arkansas towns, and gross revenue in 1945 was about $1.7 million.

## Excavation Begun for New Brooklyn Union Gas Holder

Excavation has been started preparatory to the erection of the Brooklyn Union Gas Co.'s new $1,750,000, 10.6 million cu. ft. gas holder, at 158th St. and Evans Road, Jamaica, N.Y., the company has announced.

In addition to the 165-ft. holder, a pumping station will be built on the site, which will encompass 3 1/3 acres. Completion is anticipated within the next 12 months.

According to Assistant Chief Engineer Ansel B. Huyck, the new holder, which is to be of the waterless type, will add to the stock of gas on hand when going into a cold period, and will enable the company to maintain better pressures in the eastern part of the transmission system during peak periods. Also, it is intended to give protection in case of a failure in the 30-in. transmission line into Jamaica.

## Gar Wood Buys Former Bendix Plant Near Detroit

All of the Detroit operations of Gar Wood Industries, Inc., with the exception of its body plant, will shortly be moved to the former Bendix plant in Wayne, Mich., which the company recently purchased from the War Assets Administration. The new plant will permit expansion of the company's manufacturing facilities to meet a sharply increased demand, according to Chairman John J. Bergen.

Gar Wood employment in the Detroit area is expected to increase from 1500 to approximately 3500 as a result of the larger quarters. Of steel, brick, and glass construction, the plant contains 236,000 sq. ft. of factory space and 35,000 sq. ft. of office space, and is located on a 37-acre plot.

## Vancouver Gas Holder Being Repainted; Grandview Next

Painting of the second of three gas holders by J. Boshard & Son Ltd., is under way for the B.C. Electric Railway Co. of Canada. The first two holders are located in Vancouver, the third at Grandview.

Boshard crews are at present at work on the 270-foot-high holder at the foot of Carrall St., Vancouver. Cleaning, red leading, and painting of the one-quarter million sq. ft. of steel surfaces will require about two months. Painting of the two million cu. ft. holder in Vancouver was recently completed.

## War Assets Administration Sells Carbon Black Plant

The WAA has announced the sale of a partially completed carbon black plant at Eunice, N. Mex., to Charles E. Johnson & Co. and Columbian Carbon Co. for $750,000. The 60% completed plant was intended for operation by the Johnson company to produce carbon black for the tire industry.

## FPC Authorizes Bank Loans

The Florida Power Corp., St. Petersburg, Fla., has been authorized by the FPC to make serial bank loans totaling $3,235,000 to refund its outstanding 3¼% serial debentures, maturing 1947 to 1957. Such redemption will effect substantial savings in interest.


R-C *dual-ability*

GIVES AN UNBIASED ANSWER

When we're recommending equipment to handle air, or gas, we're completely unbiased as to Centrifugal or Rotary Positive machines. That's because of our *dual-ability* to select, design and build whichever type of unit best meets your needs.

This *dual-ability* is at your service, for a 10 CFM or a 50,000 CFM (or higher) installation. You can rely upon our recommendations and the performance of our equipment, because there's almost a century of successful air-handling experience behind them. Call on us, without obligation.

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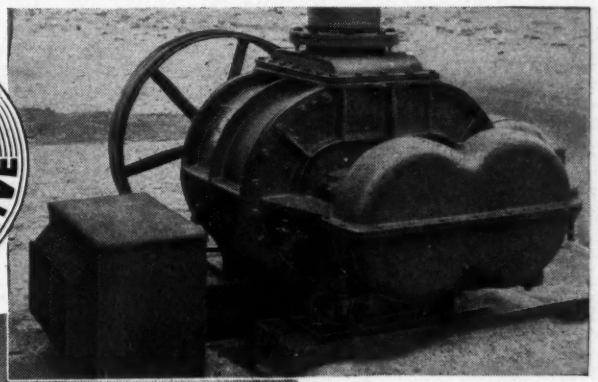
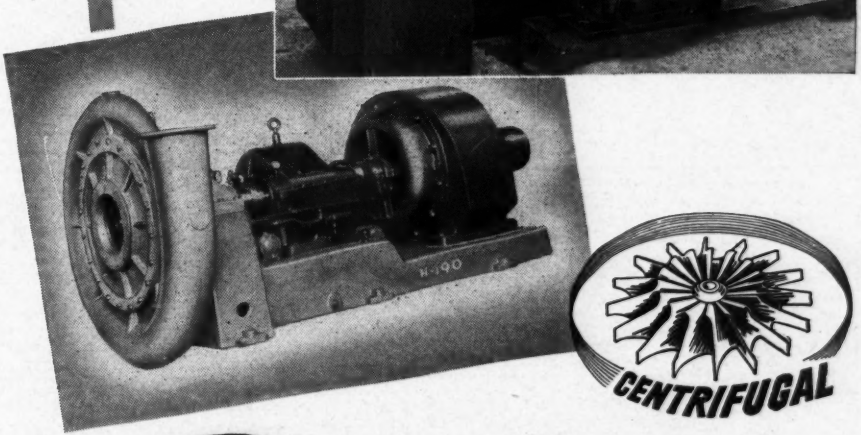
*One of the Dresser Industries*
608 Oregon Avenue, Connersville, Indiana

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If you have a problem in gas-purification, take advantage of Connelly's 71 years of experience. Our engineers will be glad to help you . . . there is no obligation. Consult Connelly!

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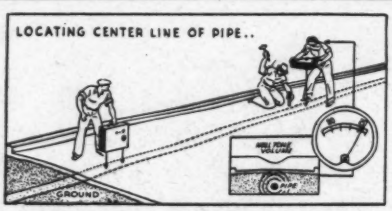


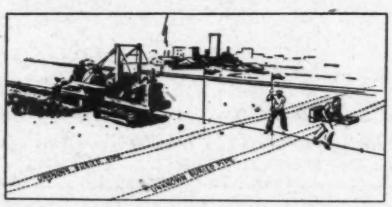

M-SCOPE

Buried Pipe and Cable Finder

16 PAGE BOOKLET FREE UPON REQUEST

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## Kansas City Gas Co. Using A.G.A. Training Course

The Kansas City Gas Co. has started three classes in the new study course offered by the American Gas Association on "Fundamentals of the Gas Industry." The classes are being held for supervisory employees of the new business, accounting and operating departments. Two sound slide films prepared by the A.G.A. will be shown at each class.

According to Ray T. Ratliff, advertising manager, a meeting will follow the original classes at which the supervisors will tie the material studied in with the company's activities. When all courses are completed, the company plans to have the films shown to other employees who will not attend the classes but who deal with the public either directly or on the telephone.

## Brooklyn Union Sells Bonds

The Brooklyn Union Gas Co. has awarded $34 million new general mortgage bonds due in 1976, to Halsey, Stuart & Co. and associates on a bid of 102.28 for a 2⅞% coupon. Halsey, Stuart & Co. plans to reoffer the bonds at 103.

# GAS PRODUCTION

• **McCarthy Oil and Gas Corp.,** Houston, has completed one of the world's largest natural gas wells with a flow through ¼-in. choke gauging of 10.8 MMcf at 7000 psi. An open flow potential has been estimated in excess of 300 MMcf daily, and the bottom hole pressure has been projected at 8796 psi. Glenn H. McCarthy, president of the corporation, stated that a gasoline absorption plant probably will be constructed in the area to utilize gas from the well.

• Sixteen new gas wells recently have been completed in the Guymon sector of the Hugoton field. Production in these wells ranged from 4.5 to 22.8 MMcf per day, at depths ranging from 2764 to 2960 ft.

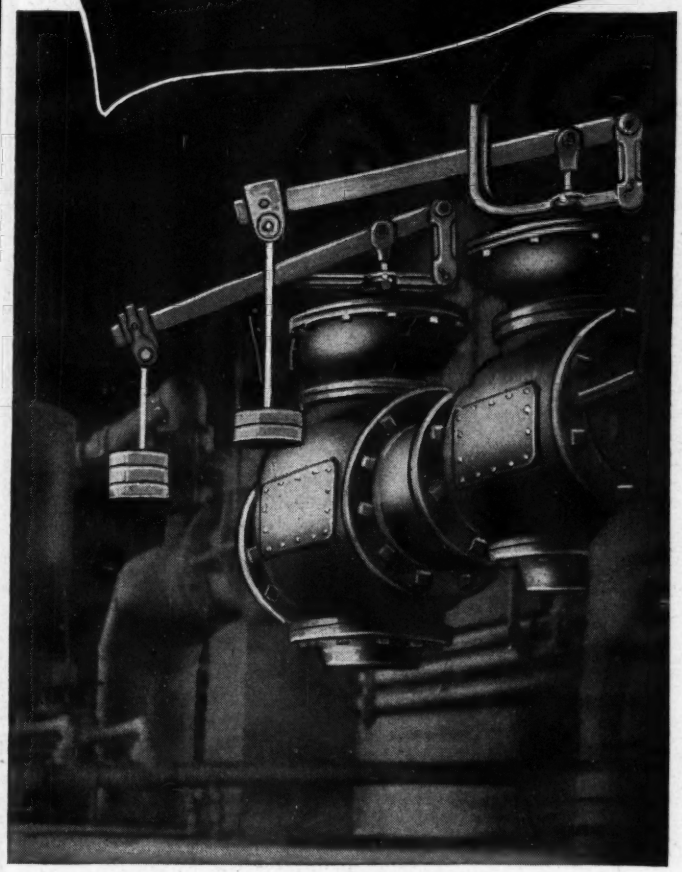
An estimated 8 MMcf of gas and a show of distillate was discovered in No. 1 Eskridge well in the Maysville area of Garvon county, Okla. The test was run in the bromide sand at 7193 to 7224 ft.

• **Standard Oil Co. of California** has announced completion of its wildcat natural gas well, Kirby Community No. 1, in the Kirby Hills area of Solano county, nine miles southeast of Fairfield. The well flowed at a daily rate of 4177 Mcf through a ½-in. bean on a completion test at 2350 ft. It blew gas on a formation test at the rate of 4870 Mcf in the interval 1530-1681 ft.

• A new gas pool for Harris county, three miles south of Fairbanks, Texas, has been opened. The strike is about two miles south of present production in the Fairbanks pool.

• **The Texas Railroad Commission** has set daily allowable production of sweet natural gas from the Rodessa field at 24,019,533 cu. ft. The order was made effective June 1.

# REYNOLDS DISTRICT STATION REGULATORS IN SERIES FOR ABSOLUTE SAFETY



REYNOLDS builds District Station Regulators in Single and Double District Types. Both Types of Regulators give satisfactory performance throughout a wide range of operating conditions. They are adaptable to use with special combinations where unusual conditions prevail. Arranged in series as illustrated, absolute safety is assured. REYNOLDS also builds a KT Series of Station Regulators having internal toggle levers which construction does not require an auxiliary bowl.

**Reynolds Service is available on any gas control problem —Write or Call!**

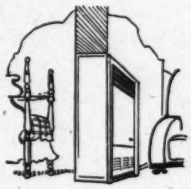
★ GAS CONTROL SINCE 1892 ★

Reynolds GAS REGULATOR CO.
ANDERSON INDIANA U.S.A.



# Another Member of the Hammel Line

## DUAL WALL HEATER



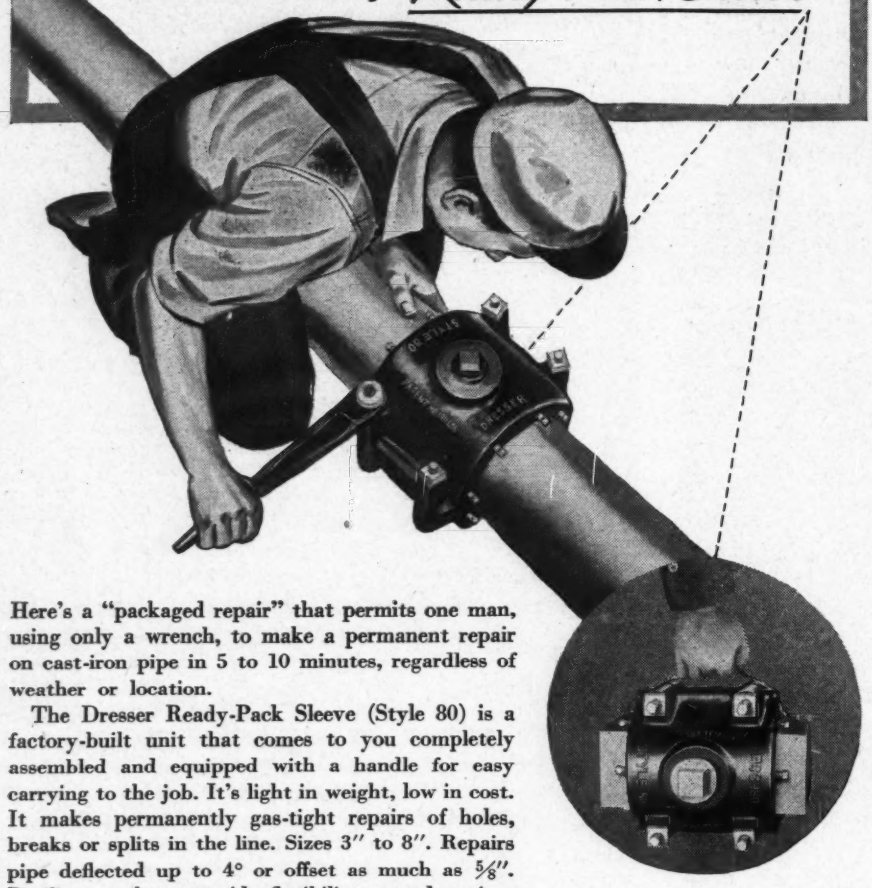
The Hammel Dual Wall Heater featured here is but one of the Hammel family of dependable gas heating and ventilating units. Regardless of your heating needs, you are invited to consult a Hammel specialist. There's no charge or obligation.

Here is the latest in economical double-space heating. No basement or pit is required . . . no floor space is needed for this efficient Hammel Heating Unit as it is installed in the wall between two rooms. This popular Hammel Unit has dual registers so that one room or both rooms may be heated. The unit is easily accessible from the room for lighting and servicing. This low cost, dependable Hammel heater is finished in attractive baked enamel to blend harmoniously into the wall.

Complete details and specifications on the Dual Wall Heater or any unit in the Hammel line will be sent on request.

Hammel
RADIATOR ENGINEERING CO.
A. S. Martinson & Associates
Successors to Hammel Radiator Corp.
3348 Motor Ave. SINCE 1912 Los Angeles 34

# A permanent pipe repair in 10 minutes with this handy *Ready-Pack Sleeve*



Here's a "packaged repair" that permits one man, using only a wrench, to make a permanent repair on cast-iron pipe in 5 to 10 minutes, regardless of weather or location.

The Dresser Ready-Pack Sleeve (Style 80) is a factory-built unit that comes to you completely assembled and equipped with a handle for easy carrying to the job. It's light in weight, low in cost. It makes permanently gas-tight repairs of holes, breaks or splits in the line. Sizes 3″ to 8″. Repairs pipe deflected up to 4° or offset as much as $\frac{5}{8}$″. Resilient gaskets provide flexibility, guard against recurrence of break. Write for information.

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Houston Office and Warehouse, 1121 Rothwell St., Sec. 16, Houston, Texas. In Canada, Dresser Manufacturing Co., Ltd., 60 Front St., West, Toronto, Ontario.

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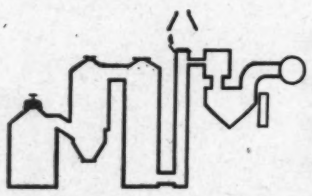

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- GAS PURIFIERS
- CONDENSERS
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- PRODUCER GAS PLANTS


# Catalogs

• **Heating, Piping and Air Conditioning Contractors' Chicago Association, 228 North LaSalle St., Chicago 1, Ill.**—This organization has developed and published a manual, "Engineering and Installation Manual, Gas-Fired Heating Equipment," which covers such subjects as heat loss survey, the heating estimate, selection of equipment, preparation of heating plants, gas piping rules, gas meters, venting, method of control and application, and inspecting and testing. An appendix of tables covers technical requirements for defining modern gas-fired heating installation methods.

• **Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill.**—Bulletin D4-2 describes Multronic Capacitrol, the company's newest development in its series of electronic temperature control. This flexible multi-position electronic pyrometer controller uses two "electronic control" circuits (no mechanical contact) which operate in harmony with each other, but independently. Control action is instantaneous. The three-color bulletin lists applications and features of the new instrument, describes its operation and shows typical installation diagrams.

• **Davis Emergency Equipment Co., Inc., 45 Halleck St., Newark 4, N.J.**—Technical bulletin No. 1116 E has just been issued on the Davis combustible gas alarm system, a method for detecting and making known the presence of hazardous gas or vapor conditions during industrial processing. The eight pages include photographs of the control panel and the explosion-proof analyzer head, describe the principle of the system, method of operation and show a schematic diagram of a typical installation.

• **Rockwell Manufacturing Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.**—The Pittsburgh Equitable Meter Division of Rockwell recently announced bulletin No. 1100 describing the Emco No. 0 domestic gas meter. The company claims three advantages of this design—improved performance, simplified repair and reduced weight. A section of the bulletin is devoted to a discussion of aluminum alloy pressure castings for use as meter bodies.

• **Stacey Brothers Gas Construction Co., Cincinnati 16, Ohio**—Bulletin D-46, now available on request, covers details and engineering data on this company's Stacey-Klonne dry seal gas holders. The 30 pages show numerous construction pictures including cross sections through the gas holder, together with general dimensions and foundation data.

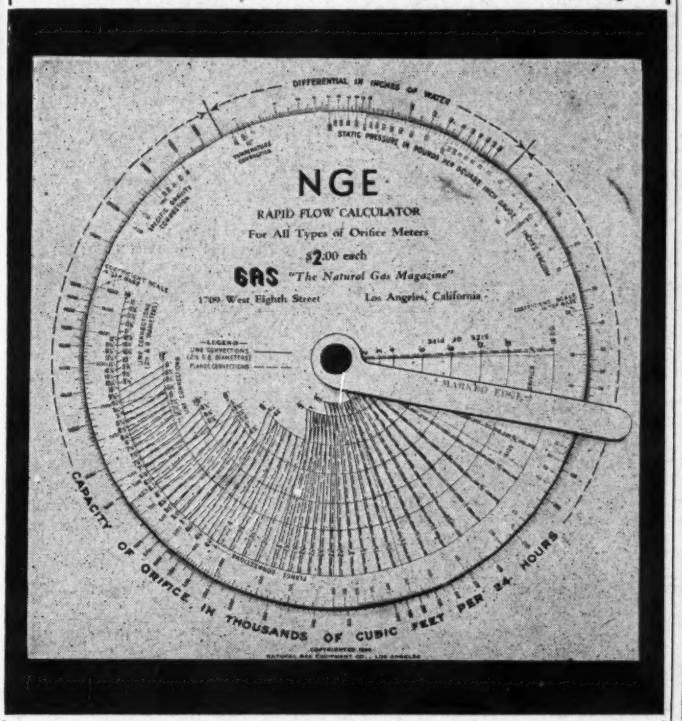
## SEC Approves Bond Sale

Portland Gas & Coke Co. has received SEC approval to sell at competitive bidding $10 million in first mortgage bonds and to sell privately $500,000 in promissory notes. Proceeds will be used to redeem outstanding bonds and first mortgage bonds assumed by Portland Gas & Coke for construction of new facilities.

## NGE RAPID FLOW

# CALCULATOR

**FROM 2 inches TO 16 inches**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RAPID FLOW CALCULATOR
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CAPACITY OF ORIFICE, IN THOUSANDS OF CUBIC FEET PER 24 HOURS

**. . . will quickly compute any of a series of variables in the transmission of natural gases.**

**SIMPLE to operate: Set dial . . . Turn indicator . . . *and instantly find***

**1 COEFFICIENT and VOLUME**
**2 CORRECT ORIFICE SIZE IN ANY GIVEN VOLUME**
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Gentlemen: Please send me.....NGE *Gas Flow Orifice Calculators* for which I am enclosing my check or money order for $..... *Add 2½% sales tax in California.*

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# TRANSITE FLUE PIPE

**for venting the modern "Freedom Kitchen"**

Helps make the kitchen CLEAN and COOL . . gets rid of grease, smoke and odors
Comes in OVAL (as well as ROUND) for concealed installation between wall studs
Easy to handle - and it's an asbestos product...
COMPLETELY RUSTPROOF!

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UNDERGROUND
pipe installation
Simple as 1·2·3
REAMER
opens up hole to just over pipe size.
up to 150
or 200 feet!
PILOT BIT
opens up the hole and maintains straight boring.
90-pounds of air pressure and sufficient water to flush back cuttings is all that's needed to operate the HYDRAUGER.
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STREET CITY ZONE STATE

## FPC Grants Rehearing on Panhandle Sales to Ford

Reconsidering its order of March 14, in which it dismissed without prejudice an application by Panhandle Eastern Pipe Line Co. to furnish natural gas service to the Ford Motor Co., the Federal Power Commission has announced that it has granted a rehearing, scheduled for Aug. 26, in Washington, D.C.

On April 25, Panhandle submitted an application for reconsideration, asking that either the order be abrogated, that it be modified by dismissing the application for want of jurisdiction, or that a rehearing be granted; because, according to the petition, the subject matter of the application "is excluded from the requirements of the provisions of the Natural Gas Act." Panhandle in its petition pointed out the importance of the ruling to the commission and to the entire gas industry.

When the order of March 14 was issued, FPC expressed the opinion that the proposed sale to Ford would impair service to present customers, holding that the company did not have the capacity to sell a large quantity of gas to a new buyer without imperiling its ability to service its existing customers.

The new order consolidates proceedings arising out of complaints filed by the City of Detroit and Wayne County, Mich., Michigan Consolidated Gas Co., and others.

## Gas Stove Works Acquired By Caloric Stove Corp.

The entire business and properties of the Caloric Gas Stove Works have been acquired by the Caloric Stove Corp. of Philadelphia, President Nathan Klein has announced. Production of the same line of gas ranges will continue with no changes in executive personnel.

Caloric has a 130-acre plant at Topton, Pa.

## Extraction Plant Planned

The Deerfield Petroleum Co., Inc., has announced that it will begin construction of a $100,000 plant one mile west of Deerfield, Kan., to extract gasoline from natural gas. Thomas Creigh, Jr., of Wichita, Kan., is president of the recently formed corporation.

# SALES SHORTS

• **Tappan Stove Co.** sales coverage is now back to its pre-war coverage with the release of its last two sales representatives from the armed forces, according to Keith B. Miller, sales manager. Major Martin V. Wolf, who served on the adjutant general's staff in the European theater, has returned to his territory in northern Indiana, and Lieut. (j.g.) David C. Rainey is back in the northern West Virginia area following Pacific duty aboard a minesweeper.

• **Northrup Supply Co.**, Binghampton, N.Y., has been appointed New York distributor for the new Coroaire Console Model 85-G gas-fired winter air conditioner, A. W. Conley, vice president and general manager of Coroaire Heater Corp., has announced.

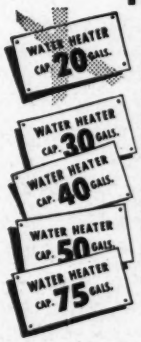
HERE IS A TYPICAL P·G·and·E· NEWSPAPER AD PROMOTING GAS

## ASK YOUR WATER HEATER DEALER

*He knows what's right for YOUR home*

In today's living there is need for greater and greater use of hot water because modern homes have both showers and bathtubs. Modern washing machines, linoleum floors and white woodwork also call for plenty of hot water in housecleaning. Be wise, talk things over with your water heater dealer. No modern home with bathroom, laundry and kitchen can get adequate hot water service from a 20-gallon water heater. An inadequate heater cannot store up enough water for peak use, it becomes constantly overworked and wears itself out.

## "SIZE-UP" YOUR WATER HEATER FOR MODERN HOME USE


WATER HEATER CAP. 20 GALS.
WATER HEATER CAP. 30 GALS.
WATER HEATER CAP. 40 GALS.
WATER HEATER CAP. 50 GALS.
WATER HEATER CAP. 75 GALS.

| *Number Bathrooms* | *Number Bedrooms* | *Storage Capacity Gallons* |
|---|---|---|
| 1 | 1 or 2 | 30 |
| 1 | 3 or 4 | 40 |
| 2 | 2 or 3 | 40 |
| 2 | 4 or 5 | 50 |
| 3 | 3 | 50 |
| 3 or 4 | 4 or 5 | 75 |

*Endorsed by State Master Plumbers Association*
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*"Give That They May Have"*

**SUPPORT THE EMERGENCY FOOD AND FUND DRIVE**

**SEE YOUR DEALER, OR** G 208-846

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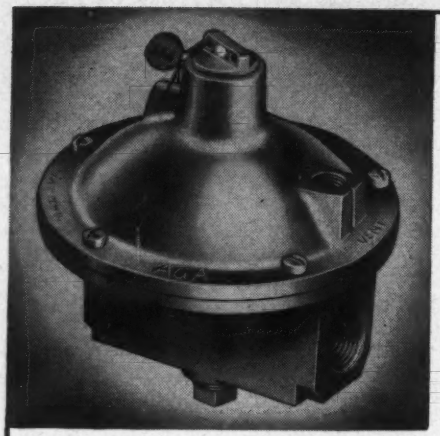

H-M Low Pressure Gas Regulator  Sizes from ⅜ in. to 1½ in.

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H-M

## Appliance REGULATORS

APPROVED BY A.G.A.

The "H-M" low pressure regulator is readily adaptable to practically every type and size of household or domestic appliance. It is designed to insure accurate performance under all field conditions with practically trouble-free operation.

"H-M" Regulators are ruggedly built of high quality aluminum; are extremely light in weight to facilitate handling and to provide for low shipping cost. The sturdy construction will withstand much more than ordinary abuse. Body and cover castings and all internal parts are of corrosion-resistant materials.

Each and every "H-M" Regulator is factory tested, adjusted and sealed to the customer's individual specification.

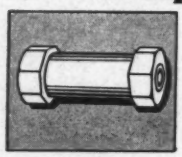
**THERMAC COMPANY**

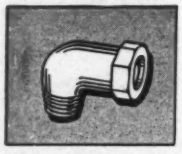
800 EAST 108 ST. • LOS ANGELES 2, CALIF.

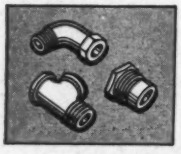


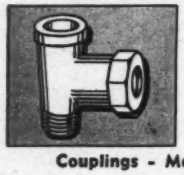
# NORMAC COUPLINGS SLEEVES AND FITTINGS

***for maximum deflection, ease of "stabbing," complete confinement of the rubber!***









So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

**NORTON-McMURRAY**
**MANUFACTURING COMPANY**
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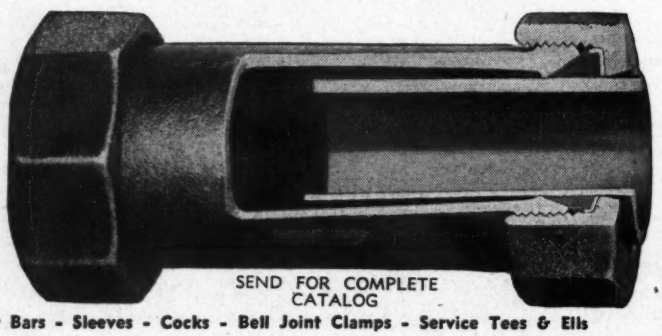

SEND FOR COMPLETE CATALOG

**Couplings - Meter Bars - Sleeves - Cocks - Bell Joint Clamps - Service Tees & Ells**


## Conlon Corp. Reorganizes And Expands Moore Corp.

The Conlon Corp., Chicago, has announced the reorganization of the executive staff of the Moore Corp., Joliet, Ill., which was purchased several months ago by Conlon.

Bernard J. Hank, head of Conlon, is the new Moore president, and will continue as its chairman of the board and treasurer. The Moore staff includes Harry T. Worthington, vice president and general manager; John M. Foxx, vice president in charge of sales; and Orville E. Oesterle, general factory superintendent. W. A. Stuckey is chief engineer and F. E. Wright is secretary. The firms will operate as separate units, Conlon continuing under I. N. Merritt as vice president and general manager.

Moore plant improvements are to be completed as rapidly as machinery and materials are available with eventual capacity to be ten times peak prewar facilities. Conlon also is modernizing its plant and equipment, expanding production facilities to fourfold prewar capacity.

## Cincinnati Gas & Electric Wins Fleet Safety Award

An impressively low accident record for 1945 brought to the Cincinnati Gas & Electric Co., Cincinnati, Ohio, the first place award in the public utilities division of the Fleet Safety Contest sponsored by the Traffic Safety Council of that city.

In overall competition with the city of Cincinnati, the company's trucks compiled a rate of 1.2 per 100,000 miles as against the city's 7.8 per 100,000 miles. The company operated 217 trucks during the period covered in the contest as against the city's 450.

In the passenger car division, the record established by their 228 cars was .66 per 100,000 compared with 2.8. Collectively, the 445 vehicles owned by the company traveled over 4.75 million miles.

## Home Service Conference Held in Kansas City

The Kansas City Gas Co., Wyandotte County Gas Co., and The Gas Service Co. held a general home service conference in Kansas City on July 17 and 18. All members of the home service departments of the companies attended, as well as some junior apprentices. Among speakers who addressed the conference were H. Vinton Potter, director, New Freedom Gas Kitchen program of the A.G.A., and Jessie McQueen, A.G.A. home service counsellor, New York.

## Ohio Adjustments Approved

The FPC has approved proposals made by The Ohio Fuel Gas Co., Columbus, Ohio, for accounting adjustments involving the elimination of $15,776,358 from its gas plant accounts. Of this total, $998,695 represents the difference between acquisition cost and actual cost or estimated original cost of acquired properties, and $14,777,663 represents principally the difference between book amounts and cost of properties acquired from associated companies and other items improperly capitalized.